

Appendix P

Noise and Vibration Impact Assessment



POWERHOUSE ULTIMO RENEWAL

ULTIMO, NSW

NOISE AND VIBRATION ASSESSMENT

RWDI # 2203935

17 May 2022

SUBMITTED TO

Stephen Fabling

stephen.fabling@create.nsw.gov.au

**Department of Enterprise, Investment
and Trade (Create NSW)**

Level 10, 52 Martin Place
Sydney NSW 2000

SUBMITTED BY

Claire Graham-White

Claire.Graham-White@rwdi.com

T: +61 2 8000 9832

Davis Lai

B.E.(Civil)

Project Manager

Davis.lai@rwdi.com

Kevin Peddie

B.E.(Aero), MsEM, CPEng., NER

Director of Projects | Associate

kevin.peddie@rwdi.com

T: +61 2 8103 4020 2325

RWDI Australia Pty Ltd (RWDI)

Suite 602, 80 William Street

Woolloomooloo NSW 2011

T: +61 2 9437 4611

E-mail: solutions@rwdi.com

ABN: 86 641 303 871

DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Draft	27 April 2022	Claire Graham-White	John Wasserman
B	Final	4 May 2022	Claire Graham-White	John Wasserman
C	Final	17 May 2022	Claire Graham-White	John Wasserman

NOTE

All materials specified by RWDI Australia Pty Ltd (RWDI) have been selected solely on the basis of acoustic performance. Any other properties of these materials, such as fire rating, chemical properties etc. should be checked with the suppliers or other specialised bodies for fitness for a given purpose.

The information contained in this document produced by RWDI is solely for the use of the client identified on the front page of this report. Our client becomes the owner of this document upon full payment of our **Tax Invoice** for its provision. This document must not be used for any purposes other than those of the document's owner. RWDI undertakes no duty to or accepts any responsibility to any third party who may rely upon this document.

WILKINSON MURRAY

In October 2020, Wilkinson Murray Pty Ltd merged with RWDI Group, a leading international consulting firm. Wilkinson Murrays core practice areas of noise, acoustics, vibration and air quality consulting built since 1962 servicing Australia and Asia-Pacific region will complement RWDI practice areas. Combined, RWDI+Wilkinson Murray is one of the largest teams globally specialising in the area of noise, acoustics, vibration and air quality.

RWDI

RWDI is a team of highly specialised consulting engineers and scientists working to improve the built environment through three core areas of practice: building performance, climate engineering and environmental engineering. More information is available at www.rwdi.com.

AAAC

This firm is a member firm of the Association of Australasian Acoustical Consultants and the work here reported has been carried out in accordance with the terms of that membership.



QUALITY ASSURANCE

RWDI Australia Pty Ltd operates a Quality Management System which complies with the requirements of AS/NZS ISO 9001:2015. This management system has been externally certified by SAI Global and Licence No. QEC 13457 has been issued for the following scope: The provision of consultancy services in acoustic engineering and air quality; and the sale, service, support and installation of acoustic monitoring and related systems and technologies.



GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (LA_{max}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

LA₁ – The LA₁ level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the LA₁ level for 99% of the time.

LA₁₀ – The LA₁₀ level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the LA₁₀ level for 90% of the time. The LA₁₀ is a common noise descriptor for environmental noise and road traffic noise.

LA₉₀ – The LA₉₀ level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the LA₉₀ level for 10% of the time. This measure is commonly referred to as the background noise level.

LA_{eq} – The equivalent continuous sound level (LA_{eq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (LA₉₀) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

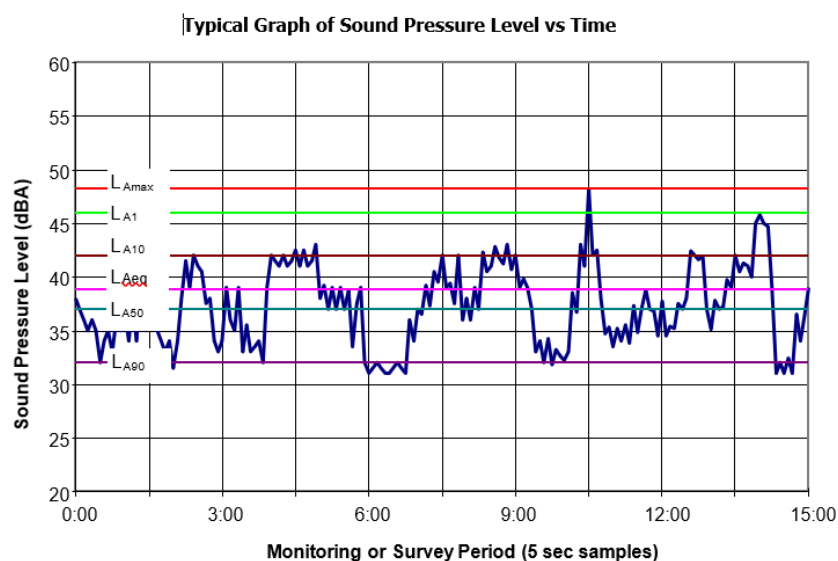


TABLE OF CONTENTS

GLOSSARY OF ACOUSTIC TERMS

1	INTRODUCTION	1
1.1	Process.....	1
1.2	Site Description	1
1.3	Assessment Requirements.....	2
1.4	Scope	3
1.5	Policy.....	3
2	PROJECT DESCRIPTION	4
2.1	Site Overview	4
2.2	Site Location.....	4
2.3	Proposed Development.....	5
2.4	Noise Catchment Areas	6
3	ENVIRONMENTAL NOISE CRITERIA	8
3.1	Ambient Noise Levels.....	8
3.2	Noise Monitoring Results.....	8
3.3	Attended Measurements.....	9
4	ACOUSTIC DESIGN CRITERIA	13
4.1	Environmental Noise Emissions (Operational Noise)	13
4.1.1	Intrusiveness Noise Level.....	13
4.1.2	Amenity Noise Level	14
4.1.3	Project Specific Noise Levels.....	15
4.1.4	Sleep Disturbance.....	16
4.2	Internal Noise Levels	16
5	ACOUSTIC REQUIREMENTS	17
5.1	Mechanical Equipment.....	17



5.2	External Noise Intrusion.....	17
5.3	Road Traffic Noise	17
5.4	Vibration	17
6	CONSTRUCTION NOISE AND VIBRATION IMPACT ASSESSMENT	18
6.1	Acoustic Criteria / Management Levels	18
6.1.1	Noise – Interim Construction Noise Guideline (EPA, 2009).....	18
6.1.2	Vibration – Construction Noise & Vibration Strategy (TfNSW, 2018)	19
6.2	Proposed Construction Hours	20
6.3	Proposed Works.....	20
6.3.1	Predicted Construction Noise Impacts.....	21
6.3.2	Construction Noise Mitigation.....	22
6.4	Predicted Construction Vibration Impacts.....	24
7	CONCLUSIONS	25
8	STATEMENT OF LIMITATIONS.....	26
9	REFERENCES	27

LIST OF APPENDICES

Appendix A: Unattended Noise Monitoring Graphs

1 INTRODUCTION

This noise and vibration report has been prepared on behalf of the Department of Enterprise, Investment and Trade (Create NSW) to support a State Significant Development (SSD) Development Application (DA) for alterations and additions to Powerhouse Ultimo at 500 Harris Street, Ultimo.

The Powerhouse Ultimo Renewal is a transformative \$480-\$500 million investment by the NSW Government to establish a world-class museum that will significantly contribute to an important and developing part of Sydney. The renewal will see Powerhouse Ultimo deliver programming focused on design and fashion, presenting exhibitions that showcase the Powerhouse Collection, international exclusive exhibitions, and programs.

1.1 Process

The Powerhouse Ultimo Renewal project is for the purposes of an 'information and education facility' with a capital investment value of more than \$30 million, and such is classified as SSD pursuant to Section 13(1) of Schedule 1 of State Environmental Planning Policy (Planning Systems) 2021.

The delivery of the new Creative Industries Precinct for Powerhouse Ultimo will occur in stages, comprising the following:

- Stage 1 – Concept DA establishing the planning, design, and assessment framework for the Powerhouse Ultimo Renewal Project including the indicative land uses, maximum building envelopes, general parameters for the future layout of the site, and strategies to guide the subsequent detailed design phases of the project including Urban Design Guidelines and Design Excellence Strategy.
- Architectural Design Competition – A competitive design process to critically analyse and provide design alternatives for the Powerhouse Ultimo Renewal project in accordance with the planning and development framework established for the site under the Concept DA. A winning design will be selected by a jury of experts and will inform the subsequent detailed design and assessment phase (Stage 2) of the project.
- Stage 2 – A Detailed DA confirming the ultimate architectural design and operation of Powerhouse Ultimo and assessing any associated planning and environmental impacts. This Detailed DA will seek consent for the detailed design, construction and operation of the proposed development and follows the same planning assessment and determination process as the Concept DA (Stage 1).

1.2 Site Description

Powerhouse Ultimo is situated upon the lands of the Gadigal people of the Eora Nation. It is located within the City of Sydney Local Government Area and its primary address is 500 Harris Street, Ultimo.

The site contains two heritage-listed buildings, being the 'Ultimo Power House' (c.1899-1905) and the 'Former Ultimo Post Office including interior' (c.1901), both of which are listed on the State Heritage Register under the Heritage Act 1997.

Other buildings within the site include the former tram shed (Harwood Building) and the 1988 museum building fronting Harris Street (Wran Building). A café building has been constructed immediately to the south of the Power House at the northern end of the Ultimo Goods Line. Located at the corner of Harris Street and

Macarthur Street is a forecourt that acts as the main public entrance to the site but provides limited activation and is disconnected from higher-quality urban spaces including the Ultimo Goods Line.

1.3 Assessment Requirements

The Department of Planning and Environment (DPE) has issued Secretary's Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement (EIS) for the proposed development. This report has been prepared having regard to the SEARs as they relate to noise and vibration, as described in Table 1-1.

Table 1-1 Secretary's Environmental Assessment Requirements (SEARs)

Condition No. & Description	Issue & Assessment Requirements	How It Is Addressed
12. Noise and Vibration	<ul style="list-style-type: none"> Where applicable, provide a noise and vibration assessment prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines. The assessment must detail construction and operational noise and vibration impacts on nearby sensitive receivers and structures and outline the proposed management and mitigation measures that would be implemented. 	<p>Noise and vibration emissions associated with the construction and operation of the proposed development have been assessed against the relevant EPA and State guidelines, with noise and vibration mitigation recommendations provided to ensure that the acoustic amenity of sensitive receivers in the vicinity of the site is preserved.</p> <p>This report includes assessment of operational noise impacts associated with the development. The only noise source predicted to be associated with the development is mechanical plant noise, which has been presented in section 5.1. In principle noise mitigation recommendations have been presented in section 5.1 to facilitate compliance with the relevant EPA Noise Policy for Industry.</p> <p>No changes to existing traffic patterns or traffic noise impacts are anticipated as a result of the development.</p> <p>A preliminary assessment of construction noise and vibration impacts from the development has been presented in section 6, with noise and vibration mitigation strategies presented in sections 6.3.2 and 6.4 to ensure that impacts are managed in accordance with the EPA's Interim Construction Noise Guideline.</p>



1.4 Scope

The primary purpose of this report is to determine the potential impacts of noise emissions from operation, construction, and traffic associated with the Site, and to ensure the feasibility of potential future temporary student accommodation as part of Powerhouse operations, to be confirmed in the stage 2 SSDA. Qualitative advice regarding noise during construction has also been provided.

The scope of this report is as follows:

- Establish noise limits for mechanical plant and any other operational noise sources based on attended and unattended noise monitoring
- Review likely future plant locations and include qualitative type assessment of likely outcomes and need for mitigation or likely mitigation measures
- Review the potential location of the temporary accommodation included in the reference design and undertake quantitative assessment of minimum glazing requirements
- Provide qualitative assessment of any additional traffic from the development (noting there is no parking for visitors this aspect is minimal)
- Establish construction noise and vibration criteria in line with EPA guidelines
- Undertake preliminary construction noise and vibration assessment based on available planning at the time
- Include typical construction noise and vibration mitigation measures

1.5 Policy

As required by the SEARs, noise from the site and associated traffic on public roads has been assessed in accordance with the:

- *NSW Noise Policy for Industry (NPfI) 2017;*
- *NSW ECCW Road Noise Policy (RNP) 2011;*
- *NSW EPA Interim Construction Noise Guideline (ICNG) 2009.*



2 PROJECT DESCRIPTION

2.1 Site Overview

The site contains two heritage-listed buildings, being the 'Ultimo Power House' (c.1899-1905) and the 'Former Ultimo Post Office including interior' (c.1901), both of which are listed on the State Heritage Register under the Heritage Act 1997.

Other buildings within the site include the former tram shed (Harwood Building) and the 1988 museum building fronting Harris Street (Wran Building). A café building has been constructed immediately to the south of the Power House at the northern end of the Ultimo Goods Line. Located at the corner of Harris Street and Macarthur Street is a forecourt that acts as the main public entrance to the site, but provides limited activation and is disconnected from higher-quality urban spaces including The Goods Line.

2.2 Site Location

Powerhouse Ultimo is situated upon the lands of the Gadigal people of the Eora Nation. It is located within the City of Sydney Local Government Area and its primary address is 500 Harris Street, Ultimo.

The site is bounded to the northeast by the tram line, to the northwest by William Henry Street, and to the southwest by Harris Street. The area around the site is a mixed use zoning area, with commercial, residential, recreational, and educational receivers in the adjacent streets. The site and immediately surrounding receivers are shown in Figure 2-1.

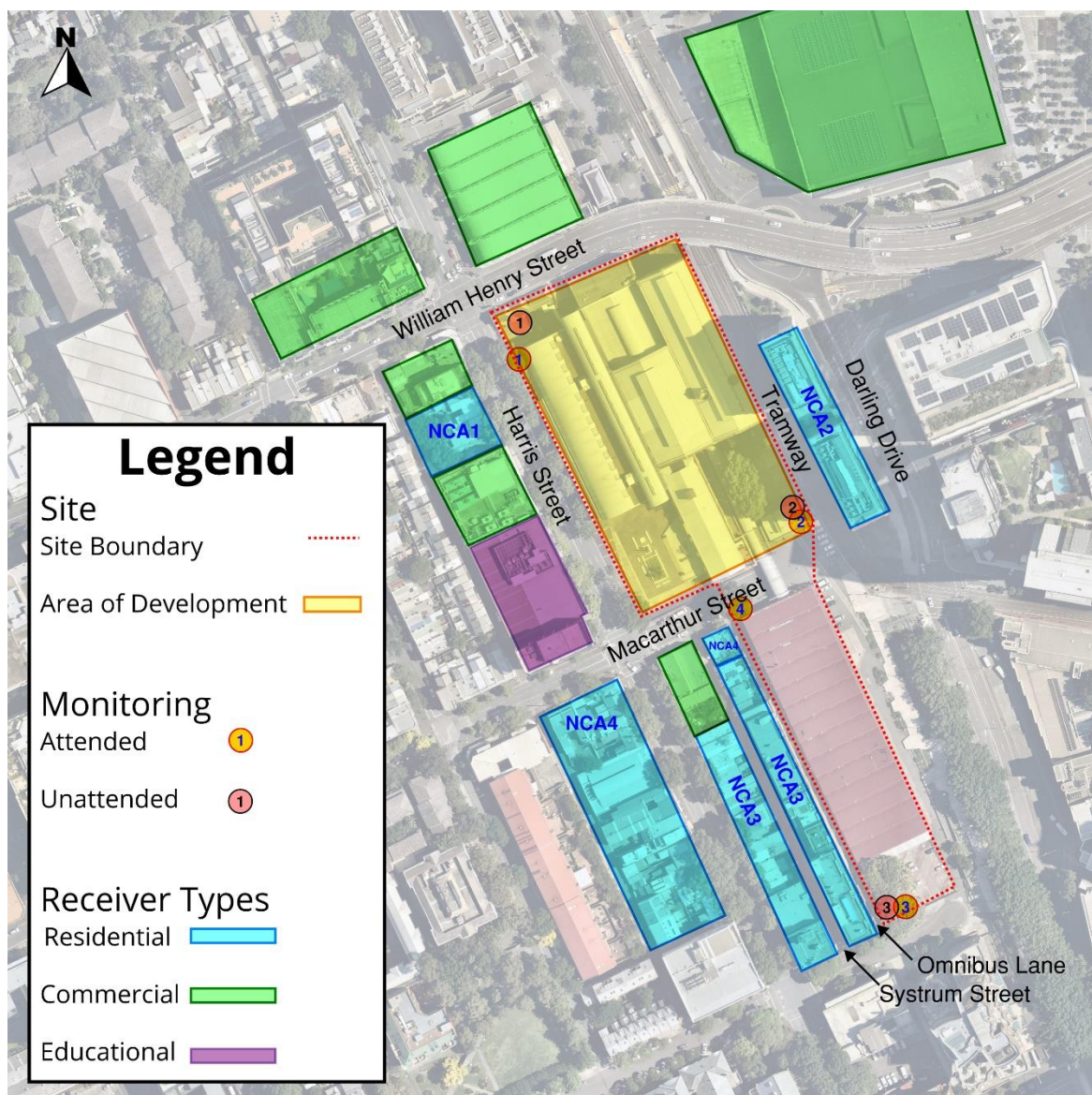


Figure 2-1 Site Location (Image supplied by Nearmap)

2.3 Proposed Development

The primary focus of the Powerhouse Ultimo Renewal project is the museum to the north of Macarthur Street and bounded by Harris Street, Pier Street and the light rail corridor. However, some enabling and minor decoupling works will occur within the broader Powerhouse Ultimo precinct.

No substantive works or changes in use are proposed to the Harwood Building located between Macarthur Street and Mary Ann Street.

For the purposes of the Concept SSDA an assessment of the reference design was completed. It is important to note, no construction works form part of the Concept SSDA. Further assessment will be required for the future detailed design stage 2 SSDA. Of primary acoustic significance is the proposed introduction of additional rooftop plant, located on the southern corner of the building, near the corner of Harris Street and MacArthur Street, and the addition of temporary accommodation to be built along the Harris Street facade.

Currently audible existing sources are assumed to form part of the existing noise environment and have not been assessed in this report. All new sources of noise are assumed to be continuously operating mechanical sources, no transient sources have been considered (e.g. no change to noise emissions from the loading dock on Macarthur Street have been considered).

The new rooftop mechanical plant proposed in the reference design is anticipated to be located at the Southeast Corner of Zone 2, shown in Figure 2-2. The temporary accommodation is likely to also be located within Zone 2.

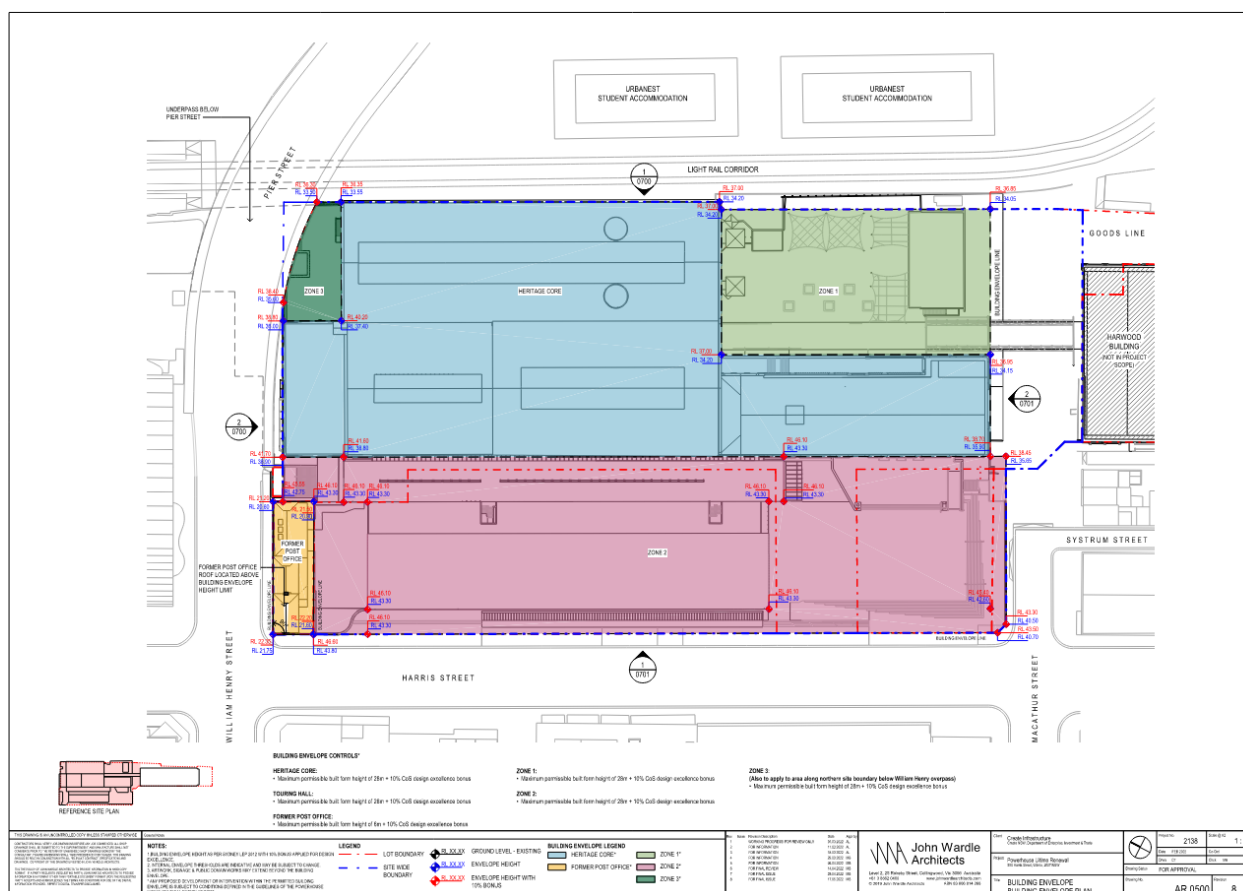


Figure 2-2: Proposed Site Layout

2.4 Noise Catchment Areas

The residential areas around the site have been divided into four Noise Catchment Areas (NCAs). The NCAs group together residential receivers with similar existing noise environments. The NCAs and sensitive receivers in the area around the development are detailed in Figure 2-1 and are shown in Figure 2-1.

The nearest residential properties are Student Accommodation (Urbanest) to the northeast of the site.

Table 2-1 Noise Catchment Areas (Refer to Figure 2-1)

NCA	Direction from Development	Description
NCA01	West	Residential houses located on Harris Street opposite the Site. The noise environment is dominated by traffic on Harris Street.
NCA02	Northeast	Student Accommodation (Urbanest) located adjacent to the site, on the other side of the tram-line. Dominant noise sources in the area are transport noise from Darling Drive and the tram line, and other industrial noise sources
NCA03	South	Residential terrace and apartment block housing located along Omnibus Lane and Systrum Street. The noise environment is made up of ambient industrial sources with varying degrees of traffic noise from Harris Street.
NCA04	South	Residential housing located on Macarthur Street, either side of Harris Street. The noise environment includes a significant contribution of traffic noise from Harris Street.

3 ENVIRONMENTAL NOISE CRITERIA

3.1 Ambient Noise Levels

In order to quantify and characterise the existing noise environment in the area, long-term ambient noise levels were monitored between 5 April and 19 April 2022, at three (3) locations, selected to cover the range of ambient noise environments surrounding the site.

Long-term noise monitoring locations are presented in Table 3-1 and shown in Figure 2-1.

Table 3-1 Unattended Noise Monitoring Locations

ID	Location	Representative Receptor	Instrumentation
U1	Old Post Office Courtyard, on Harris Street	Harris Street Traffic Noise for Future Powerhouse Accommodation	Rion NL52 077-G
U2	Café Rooftop	Urbanest Student Accommodation	Rion NL52 768-G
U3	Staff Courtyard, Mary-Ann Street	Omnibus Lane and Systrum Street Residences	ARL NGARA 8780FA

Instrumentation for the survey comprised 2 Rion NL-52 Environmental Noise Loggers and 1 Acoustic Research Laboratories (ARL) NGARA Environmental Noise Loggers (refer Table 3-1) fitted with microphone windshields. Calibration of the loggers was checked prior to and following measurements. Drift in calibration did not exceed ± 0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

The loggers continuously sampled noise levels over the entire survey period and calculated relevant statistical indices for each 15-minute interval. Data measured during periods of adverse weather, established through consultation with historical weather reports provided by the Bureau of Meteorology (BOM), has been excluded.

3.2 Noise Monitoring Results

Data from noise loggers has been used to determine the project specific criteria on which to base assessment of operational noise emissions, as per requirements in the NSW Environment Protection Authority's (EPA) *Noise Policy for Industry* (NPfI). No secure location was available to leave an unattended monitor on Macarthur Street, so the logger at location U3 has been used for both NCA3 and NCA4, with adjustments to be determined based on attended noise monitoring, at A3 and A4.

Data from logger location U1 has also been used to nominate appropriate façade constructions for the proposed new accommodation fronting onto Harris Street.

Table 3-2 details the RBL (background) noise levels and the L_{Aeq} noise levels during the NPI assessment time periods of daytime, evening and night-time periods. Refer to Appendix A for graphs of the unattended noise monitoring data.

In accordance with the NPfl, weather-affected data (periods where average wind speeds have exceeded 5m/s and/or have been affected by rain) have been excluded in determining the ambient and background noise levels.

Table 3-2 Measured Ambient Noise Levels

Location	Descriptor	Noise Level – dBA re 20 µPa		
		Day ¹	Evening ²	Night ³
U1	RBL	56	57	49
	L _{Aeq}	69	69	65
U2	RBL	49	49	44
	L _{Aeq}	55	54	50
U3	RBL	47	50	45
	L _{Aeq}	57	56	52

Note 1: Day is defined as 7:00 am to 6:00 pm, Monday to Saturday and 8:00 am to 6:00 pm Sundays and Public Holidays

Note 2: Evening is defined as 6:00 pm to 10:00 pm, Monday to Sunday and Public Holidays

Note 3: Night is defined as 10:00 pm to 7:00 am, Monday to Saturday and 10:00 pm to 8:00 am Sundays and Public Holidays

3.3 Attended Measurements

The locations of the attended monitoring are shown on Figure 2-1 and are listed, along with the measured L_{Aeq} levels in Table 3-3. To assist in determining the appropriate criteria. Criteria for NCA4 (residents on Macarthur Street) were determined using a comparison of attended measurements taken at A3 and A4.

Table 3-3 Attended Noise Measurements

ID	Location	Date and Time	L _{Aeq} dBA	L _{A90} dBA	Observed Noise Sources
A1	Harris Street	5/04/2022 12:53 PM	70	61	Traffic on Harris Street LAF 64-76
A2	Café Rooftop	5/04/2022 11:22 AM	54	52	Traffic on Darling Drive LAF ~56 Mechanical Sources including discharge on roof of Site LAF 52 Tram passby (far track) LAF 58
		19/04/2022 2:38 PM	58	53	Mechanical Sources including discharge on roof of Site LAF 52 Pedestrian noise from Site LAF 47 Traffic on Darling Drive, Harris Street, Pier Street, each LAF ~56 Motorbikes on Darling Drive LAF 70-74 Tram passby (far track) LAF 59 Tram passby (near track) LAF 60-81
A3	Corner Omnibus Lane and Mary Ann Street	5/04/2022 12:29 PM	56	54	Mechanical noise from UTS building LAF 53 Traffic on Darling Drive LAF 55-60 Traffic on Harris Street LAF 55-60
		19/04/2022 4:06 PM	58	53	Traffic from Harris Street LAF 54-59, Heavy vehicle passby on Harris Street LAF 64 Motorbike passby on Harris Street LAF 71 Cars on Mary Ann Street LAF 60-62 Pedestrians talking LAF 47 Mechanical noise from UTS building LAF 53

ID	Location	Date and Time	L _{Aeq} dBA	L _{A90} dBA	Observed Noise Sources
		20/04/2022 11:04 PM	52	47	<p>Crickets</p> <p>Traffic from Harris Street LAF 53-56</p> <p>Walk lights on Harris Street LAF 52</p> <p>Traffic from Darling Drive LAF 51</p> <p>Car door slam LAF 52</p> <p>Cement truck on Harris Street LAF 63,</p> <p>Tram passby LAF 48</p>
A4	Corner Macarthur Street and Omnibus Lane	5/04/2022 2:17 PM	61	56	<p>Traffic from Harris Street LAF 55-62</p> <p>Low speed light vehicle passby in Macarthur Street LAF ~63</p> <p>Truck activity in Site loading dock LAF ~66-76</p> <p>Truck reversing beeper LAF 71</p> <p>Pedestrian noise from Site LAF ~51</p> <p>Intermittent work on corner of Harris and Macarthur LAF 58-66</p>
		19/04/2022 4:28 PM	58	53	<p>Traffic on Harris Street LAF 55-62</p> <p>Car leaving omnibus lane carpark LAF 63</p> <p>Tram passby LAF 52</p> <p>Industrial noise from Site LAF 51</p> <p>Aeroplane pass over LAF 59-62</p> <p>Car horn LAF 64</p> <p>Bicycle passby LAF 57-62</p> <p>Van and car low speed passby LAF 62</p> <p>Car idling in Macarthur Street LAF 60</p> <p>Leaves rustling</p>

TYPE: NOISE AND VIBRATION ASSESSMENT
POWERHOUSE ULTIMO RENEWAL

RWDI#2203935
 17 May 2022



ID	Location	Date and Time	L _{Aeq} dBA	L _{A90} dBA	Observed Noise Sources
		20/04/2022 11:26 PM	53	49	Industrial hum, main sources rooves in omnibus lane and Powerhouse roof Powerhouse ground level AC discharge LAF 59 Occasional traffic from Darling Drive LAF 53 Traffic from Harris Street LAF 52-58 Truck passby LAF 63-70 Pedestrian crossing lights LAF 49 Tram passby (far track, at speed) LAF 50-58 Tram passby (near track, braking) LAF 50-54 Light Vehicle departure LAF 65 Cyclist passby LAF 59

4 ACOUSTIC DESIGN CRITERIA

4.1 Environmental Noise Emissions (Operational Noise)

Operational noise from the proposed facilities will be generated by mechanical services plant. The NPfI documents a procedure for assessment and management of industrial noise which involves determining the project specific noise levels for a development. The project specific noise level is a benchmark level above which noise management measures are required to be considered. They are derived by considering short-term intrusiveness due to changes in the existing noise environment (applicable to residential receivers only) and maintaining noise level amenity for particular land uses for residents and other sensitive receivers.

4.1.1 Intrusiveness Noise Level

For assessing intrusiveness, the background noise level (L_{A90}) is measured and the Rating Background Level (RBL) determined. The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous noise level (L_{Aeq}) of the source (measured over a 15-minute period) does not exceed the background noise level (RBL) by more than 5dBA. The intrusiveness criteria is only applicable to residential receivers. The intrusiveness criteria at each residential NCA is presented in Table 4-2.

The adjustment to the RBL for receivers at NCA4 has been determined using the most conservative difference in L_{A90} noise levels recorded at A3 and A4 in sequential attended measurements. For the daytime and evening period this adjustment is 0 dB (afternoon measurements on the 19th of April). For the night-time period this adjustment is 2 dB (night-time measurements on the 20th of April)

Table 4-1 Measured Ambient Noise Levels

NCA	Representative Noise Logger	Time of Day ¹	RBL	Criteria
NCA1	U1	Day	56	61
		Evening	57	62
		Night	49	54
NCA2	U2	Day	49	54
		Evening	49	54
		Night	44	49
NCA3	U3	Day	47	52
		Evening	50	52 ²
		Night	45	50
NCA4	U3	Day	47	52
		Evening	50	52 ²
		Night	47	52

Note 1: As defined in Table 3-2

Note 2: Section 2.3 of the NPI specifies that the Intrusiveness Criteria for evening should be no greater than the Intrusiveness Criteria for daytime

4.1.2 Amenity Noise Level

The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include transportation noise (when on public transport corridors), noise from motor sport, construction noise, community noise, blasting, shooting ranges, occupational workplace noise, wind farms, amplified music/patron noise.

The amenity noise level aims to limit continuing increases in noise levels which may occur if the intrusiveness level alone is applied to successive development within an area.

The recommended amenity noise level represents the objective for total industrial noise at a receiver location. The project amenity noise level represents the objective for noise from a single development at a receiver location.

To prevent increases in noise due to the cumulative effect of several developments, the project amenity noise level for each new source of industrial noise is set at 5dBA below the recommended amenity noise level.

The following exceptions are applicable to determining the project amenity noise level:

- For high-traffic areas the amenity criterion for industrial noise becomes the $L_{Aeq,period(traffic)}$ minus 15dBA.
- Where cumulative industrial noise is not a consideration because no other industries are present in, or likely to be introduced into the area, the relevant amenity noise level is assigned as the project amenity noise level for the development.

Amenity noise levels are not used directly as regulatory limits. They are used in combination with the project intrusiveness noise level to assess the potential impact of noise, assess mitigation options and determine achievable noise requirements. An extract from the NPfl that relates to the amenity noise levels for surrounding receivers is given in Table 4-2.

Table 4-2 Amenity Noise Levels

Receiver	Noise Amenity Area	Time of Day ¹	Recommended Amenity Noise Level L_{Aeq} (dBA)
Residential	Urban	Day	60
		Evening	50
		Night	45
Commercial	All	When in use	65
Educational	All	Noisiest 1 hour while in use	35 (Internal)
High Traffic Areas ²	NA	Day	54
		Evening	54
		Night	50

Note 1: As defined in Table 3-2

Note 2: Applies to all properties on Harris Street

4.1.3 Project Specific Noise Levels

The amenity and intrusiveness noise levels and resulting project specific noise levels (shown in bold) applicable to the project are shown in Table 4-3.

Table 4-3 Project Specific Noise Levels

Noise Catchment Area (NCA)	Period		Intrusiveness Noise Level ¹ L _{Aeq,15min} (dBA)	Project Amenity Noise Level ² L _{Aeq,15min} (dBA)	Project Specific Noise Level L _{Aeq,15min} dBA
NCA1	Day		61	54	54
	Evening		62	54	54
	Night		54	50	50
NCA2	Day		54	58	54
	Evening		54	48	48
	Night		49	43	43
NCA3	Day		52	58	52
	Evening		52	48	48
	Night		50	43	43
NCA4	Day		52	58	52
	Evening		52	48	48
	Night		52	43	43
Commercial	When in use		NA	65	65
Commercial – Harris Street	When in use	Day	NA	57	57
		Eve	NA	54	54
		Night	NA	50	50
School – Harris Street	Noisiest L _{Aeq,1hr}	Day	NA	47³	47 ³
		Eve	NA	44³	44 ³
		Night	NA	40³	40 ³

Note 1: Intrusiveness noise level is $L_{Aeq,15min} \leq RBL + 5$.

Note 2: Project amenity noise level (ANL) is the applicable ANL minus 5, plus 3dBA to convert from a period level to a 15-minute level.

Note 3: The internal amenity level has been converted to an external level assuming a 10dBA reduction from outdoor to indoors through typically open window area.

4.1.4 Sleep Disturbance

Guidance for assessing the potential for sleep disturbance impacts on nearby residences is provided in Section 2.5 of the *NPfI*, which states:

Where the subject development/premises night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- L_{Amax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,

a detailed maximum noise level event assessment should be undertaken.

Based on the above, the night-time sleep disturbance screening noise levels for the residential areas in the vicinity of the development is presented Table 4-4.

Table 4-4 Sleep Disturbance Criteria

NCA	Period	Measured RBL, L_{A90} , period	Sleep Disturbance Criteria, $L_{Aeq,15min}$	Sleep Disturbance Criteria, L_{Amax}
NCA1	Night-time (10pm-7am)	49	54	64
NCA2		44	49	59
NCA3		45	50	60
NCA4		47	52	62

Where the sleep disturbance screening noise level is predicted to be exceeded then a detailed maximum noise level event assessment should be undertaken. The detailed assessment should discuss the predicted level of the events, the exceedance of the screening level, existing maximum noise levels, and consider guidance from current literature regarding sleep disturbance, such as the *Road Noise Policy*

4.2 Internal Noise Levels

The internal noise levels in the proposed temporary accommodation in Zone 2 are recommended to comply with internal noise levels presented in AS/NZS 2107-2016, "*Acoustics - Recommended design sound levels and reverberation times for building interiors*"). The recommended noise level is presented in Table 4-5.

Table 4-5 Guidelines for Internal Noise Levels (based on AS/NZS2107:2016)

Space	Time of Day	Internal Noise Level L_{Aeq} (dBA)
Sleeping area (Hotels in inner city areas near major roads)	Night	35 to 40

5 ACOUSTIC REQUIREMENTS

5.1 Mechanical Equipment

Mechanical services associated with the development are expected to be mainly located in basement plantrooms, with some additional plant as shown on the reference design likely to be installed on the rooftop at the corner of Harris Street and Macarthur Street. Selections of specific mechanical equipment have not been finalised at this stage.

An acoustic review of mechanical plant should be undertaken at stage 2 SSDA once plant selections and locations have been finalised. Noise from the mechanical plant should be designed to comply with the project specific noise levels of the NPfI presented in Table 4-3. Specifically, the residences from 81 to 85 Macarthur Street in NCA4 are likely to be most affected.

Mitigation measures that are commonly employed to control noise emissions from mechanical equipment include using in-duct treatments such as internally lined ductwork or silencers, building barriers or enclosures around equipment or using acoustic louvers.

All sources are anticipated to be constant in nature, with no sudden changes in noise level, so compliance with the sleep disturbance criteria is expected.

5.2 External Noise Intrusion

Based upon noise monitoring location U1, and assuming an inoperable façade, a minimum glazing thickness of 8mm is recommended to meet the noise levels recommended in AS/NZS 2107:2016 on the facades of the temporary accommodation areas fronting on to Harris Street.

However, this assessment is based off measurements conducted at ground level. The noise impact on the façade will change with height, and may increase or decrease. The minimum glazing thickness required should be reviewed during detailed design (stage 2 SSDA) during which location and extent of any temporary student accommodation will be finalised.

5.3 Road Traffic Noise

The renewal does not include any changes to the current parking arrangements of the site (currently there is no visitor parking), and is not anticipated to change the traffic generation to and from the site. The proposed redevelopment is not anticipated to cause a change to the current traffic noise levels.

5.4 Vibration

No vibration intensive equipment is anticipated to be installed on site, and no surrounding receivers have an elevated sensitivity to vibration. No vibration impacts are anticipated as a result of the development.

6 CONSTRUCTION NOISE AND VIBRATION IMPACT ASSESSMENT

6.1 Acoustic Criteria / Management Levels

6.1.1 Noise – Interim Construction Noise Guideline (EPA, 2009)

The NSW EPA *Interim Construction Noise Guideline (ICNG)* requires project-specific Noise Management Levels (NMLs) to be established for noise affected receivers. In the event construction noise levels are predicted to be above the NMLs, all feasible and reasonable work practices are investigated to minimise noise emissions.

Having investigated all feasible and reasonable work practices, if construction noise levels are still predicted to exceed the NMLs then the potential noise impacts would be managed via site specific construction noise management plans, to be prepared in the detailed design phase. Table 6-1 details the *ICNG* noise management levels.

Table 6-1 Interim Construction Noise Guideline Criteria

Time of Day	NML	How to Apply
Recommended Standard Hours	Noise Affected RBL+10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq}(15min)$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays	Highly Noise Affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences; 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside Recommended Standard Hours	Noise Affected RBL+5 dBA	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the <i>ICNG</i> .

Based on the above, Table 6-2 presents the applicable noise management levels for construction activities at surrounding receivers that have been adopted for all applications. The distances between the nearest receiver in the NCA, and the nearest Zone, have also been presented.

Table 6-2 Site-Specific Construction Noise Management Levels

Location	Distance from Site (m)		Construction Noise Management Level (NMLs) - $L_{Aeq,15min}$				Highly Noise Affected Noise Level – $L_{Aeq,15min}$
	Min.	Max.	Day Standard Hours ¹	Day OOH	Evening OOH ²	Night OOH ³	
NCA1	21	61	66	61	62	54	75
NCA2	8	41	59	54	54	49	
NCA3	33	93	57	52	55	50	
NCA4	17	77	57	52	55	52	

Note 1: Standard Hours (7am – 6pm Monday to Friday, 8am – 1am Saturday with no work on Sundays or Public Holidays)

Note 2: Evening OOH (6pm – 10pm)

Note 3: Night OOH (10pm – 7am)

6.1.2 Vibration – Construction Noise & Vibration Strategy (TfNSW, 2018)

Minimum working distances for typical vibration intensive construction equipment are provided in the Transport for NSW's (TfNSW) *Construction Noise and Vibration Strategy* (CNVS).

The minimum working distances presented in Appendix D of the CNVS are for both cosmetic damage (from BS 7358) and human comfort (from the NSW EPA Vibration Guideline) and are based on empirical data which suggests that where vibration intensive works are conducted outside the minimum distances, adverse vibration impacts are unlikely.

The recommended minimum working distances for vibration intensive activities from the CNVS are presented in Table 6-3.

Table 6-3 Recommended Minimum Working Distances from Vibration Intensive Equipment

Plant Item	Approx. Size / Weight / Model	Minimum Distance	
		Cosmetic Damage (BS 7385)	Human Response (NSW EPA Guideline)
Vibratory Roller	1-2 tonne	5 m	15 m to 20 m
	2-4 tonne	6 m	20 m
	4-6 tonne	12 m	40 m
	7-13 tonne	15 m	100 m
	13-18 tonne	20 m	100 m
	> 18 tonne	25 m	100 m

Plant Item	Approx. Size / Weight / Model	Minimum Distance	
		Cosmetic Damage (BS 7385)	Human Response (NSW EPA Guideline)
Small Hydraulic Hammer	300 kg (5 to 12t excavator)	2 m	7 m
Medium Hydraulic Hammer	900 kg (12 to 18t excavator)	7 m	23 m
Large Hydraulic Hammer	1600 kg (18 to 34t excavator)	22 m	73 m
Pile Driver – Vibratory	Sheet Piles	2 m to 20 m	20 m
Piling Rig – Bored	≤ 800 mm	2 m (nominal)	4 m
Piling Rig – Hammer	12 t down force	15 m	50 m
Jackhammer	Hand held	1 m (nominal)	Avoid contact with structure

6.2 Proposed Construction Hours

Where possible, works should be completed during the standard daytime construction hours of Monday to Friday 7.00am to 6.00pm and Saturday 8.00am to 1.00pm. Where Out-of-Hours Works (OOHWs) are required (for emergency works/delivery, etc) it is likely that they would require separate approval.

6.3 Proposed Works

This report provides a preliminary assessment of the potential construction noise and vibration impacts associated with the proposed development, noting that no physical works are proposed as part of the concept DA. At the time of preparing this assessment a detailed construction programme was not developed, however the following stages and typical activities can be expected from this project:

Demolition:

- Internal Demolition work is likely to be shortest and of least impact.
- Demolition of external structures using machinery and handtools.

Earthworks:

- Likely to be shortest stage of works and of most impact.
- Earthwork required will involve operation of trucks, excavators, dozers, graders and associate equipment.

Construction:

- Staging is likely to be of longer duration with less impact than earthworks.
- Building works likely to involve a high number of truck movements, cranes and power tools.

Sound power levels (SWLs) for the typical operation of construction equipment applied in the modelling are listed in Table 6-4 and have been based on measurements conducted by RWDI and Appendix C of the CNVS. To

assess construction noise levels against the NMLs, the noise levels have been converted to equivalent $L_{Aeq,15min}$ noise emissions based on the expected period of operation of the individual pieces of construction plant.

Table 6-4 Construction Noise Sources

Stage	Equipment	Operating minutes in 15-min period	Quantity		Sound Power Level (dB)			
					Individual Item (SWL)	L _{Aeq} Activity		L _{Amax} Activity
			Max.	Min.		Max.	Min.	
Demolition	Excavator (40t)	15	1	1	112	112	0	112
	Truck & Dog (30t)	15	1	1	108	108	0	
	Hand Tools	15	5	5	105	112	105	
Earthworks	Truck & Dog (30t)	15	2	2	108	111	0	122
	Excavator (40t)	15	2	2	115	118	0	
	Dozer (D10)	10	2	2	116	117	0	
	Grader	10	1	1	105	103	0	
	Front End Loader	15	1	1	105	105	105	
Construction	Truck (20t)	15	2	2	103	103	0	117
	Mobile Crane	15	1	1	113	113	0	
	Hand Tools	7.5	5	5	105	109	105	
	Elevated Work Platform	10	1	1	97	95	97	
	Concrete Truck/Agitator	15	1	1	106	106	0	
	Concrete Pump	15	1	1	109	109	0	

6.3.1 Predicted Construction Noise Impacts

Preliminary noise impacts from construction activities have been quantitatively assessed for the NCAs surrounding the site, using a distance calculation based on the distances presented in Table 6-1. No building shielding is considered in the case of NCA3. The activities considered are described in Table 6-4.

The $L_{Aeq,15min}$ noise levels at the surrounding NCAs are provided in Table 6-5. A worst case scenario is considered based on the maximum predicted activity occurring at the minimum distance between the Site and the receivers. The lower limit of the shown range assumes reduced activity, happening in the area of site farthest from the receivers.

Table 6-5 Predicted Construction Noise Impacts

Stage	NCA	Noise Level – L _{Aeq,15min} dBA					Highly Noise Affected Level		
		Range of at nearest receiver	Noise Affected Noise Management Levels (NMLs)						
			Day ¹ Standard	Day OOH	Eve OOH ²			Night OOH ³	
Demolition	NCA1	61-81	66	61	62	54	75		
	NCA2	65-90	59	54	54	49			
	NCA3	58-78	57	52	55	50			
	NCA4	59-83	57	52	55	52			
Earthworks	NCA1	61-87	66	61	62	54		75	
	NCA2	65-95	59	54	54	49			
	NCA3	58-78	57	52	55	50			
	NCA4	59-89	57	52	55	52			
Construction	NCA1	62-82	66	61	62	54			75
	NCA2	66-90	59	54	54	49			
	NCA3	58-78	57	52	55	50			
	NCA4	60-84	57	52	55	52			

Note 1: Standard Hours (7am – 6pm Monday to Friday, 8am – 1am Saturday with no work on Sundays or Public Holidays)

Note 2: Evening OOH (6pm – 10pm)

Note 3: Night OOH (10pm – 7am)

During standard construction hours (as defined in the ICNG), noise during all stages of work has the potential to exceed the highly noise affected level of $L_{Aeq,15min}$ 75 dBA at all NCAs, with the possible exception of NCA3 once building shielding is taken into account. The most affected receivers are the student accommodation blocks located a short distance from site, in NCA2.

No construction plan is currently available, and the results presented in Table 6-5 assume no mitigation. General measures to manage construction noise emissions are discussed in section 6.3.2. Between 5 and 15 dB of mitigation of site activities can be readily achieved using a combination of these measures.

A detailed CNVMP should be developed by the nominated contractor, prior to the start of works.

6.3.2 Construction Noise Mitigation

As discussed in section 6.3.1, noise levels from construction activities during standard hours are predicted to exceed the highly noise affected level of the ICNG at several receivers surrounding the site. In accordance with the ICNG, all reasonable and feasible measures should be applied to manage construction noise emissions from the site. In particular, the following is recommended:

A detailed Construction Noise and Vibration Management Plan (CNVMP) should be prepared and should include, but not be limited to the following:

- Identification of nearby residences and other sensitive land uses;
- Description of approved hours of work;
- Description and identification of construction activities, including work areas, equipment and duration;
- Description of what work practices (generic and specific) will be applied to minimise noise;
- Consider the selection of plant and processes with reduced noise emissions;
- A complaints handling process;
- Noise monitoring procedures;
- Overview of community consultation required for identified high impact works;
- Overview of community consultation process and assessment required for identified additional works outside of standard construction hours; and
- Induction and training will be provided to relevant staff and sub- contractors outlining their responsibilities with regard to noise.

Examples of typical construction noise mitigation measures are provided in **Table 6-6**, along with the likely reduction in noise levels. Where reasonable and feasible, these measures should be employed during the construction of the development.

Table 6-6 Indicative Construction Noise Mitigation Measures

Mitigation Measure	Anticipated Noise Reduction, dBA
Administrative Controls	
Operate during approved hours	N/A
Undertake regular noise monitoring to determine the impact of operating plant on sensitive receivers	N/A
Appropriate training of onsite staff	N/A
Undertake community consultation and respond to complaints in accordance with established project procedures	N/A
Turning off machinery when not in use	0-5
Respite periods for pile drivers and rock breakers (if applicable)	N/A
Conducting regular maintenance of plant to ensure that they are operating as efficiently and quietly as practicable	N/A
Engineering Controls	
Portable temporary screens	5-10
Screen or enclosure for stationary equipment	10-15
Maximising the offset distance between noisy plant items and sensitive receivers	3-6
Avoiding using noisy plant simultaneously and / or close together, adjacent to sensitive receivers	2-3
Orienting equipment away from sensitive receivers	3-5
Carrying out loading and unloading away from sensitive receivers	3-5

Mitigation Measure	Anticipated Noise Reduction, dBA
Using dampened tips on rock breakers	3-6
Using noise source controls, such as the use of residential class mufflers, to reduce noise from all plant and equipment including bulldozers, cranes, graders, excavators and trucks	5-10
Selecting site access points and roads as far as reasonably practicable away from sensitive receivers	3-6
Using spotters, closed circuit television monitors, "smart" reversing alarms, or "squawker" type reversing alarms in place of traditional reversing alarms	2-5
Employ non noise-generating structures such as site offices, storage sheds, stockpiles and tanks as noise barriers	5-10

6.4 Predicted Construction Vibration Impacts

The nearest neighbouring residential buildings to the site are Urbanest located across the tram line, and addresses 81 through 85 Macarthur street, opposite the site across Macarthur Street.

If any of the equipment listed in Table 6-3 has the potential to be used at a distance less than the minimum working distances recommended for avoiding potential cosmetic building damage and impacts to human comfort, or if there are any other vibration intensive plant items that the Contractor has concerns for causing disruption at neighbouring development, it is recommended that a preliminary vibration survey (typically attended vibration measurements) be undertaken of each vibration generating piece of plant.

This vibration survey will determine whether there will be any exceedances of the relevant construction vibration criteria. If exceedances are observed, vibration mitigation and management strategies can be developed to minimise vibration impacts as far as practicable, and ideally to be compliant with the vibration criteria.

The vibration management strategy may also include the installation of unattended vibration monitors at sensitive receivers to notify the contractor of any exceedances of the vibration criteria. Any such vibration management strategy should be developed as part of a CNVMP.

7 CONCLUSIONS

This report has presented a noise and vibration impact assessment for the proposed Powerhouse Ultimo Renewal project, located at 500 Harris Street, Ultimo. This assessment has been prepared to address the noise and vibration clauses of the SEARs for the State Significant Development Application (SSD 32927319) issued 18 January 2022.

Existing ambient noise levels have been established at nearby sensitive receivers via long-term unattended noise monitoring as presented in Section 3. The noise monitoring data has been processed in accordance with the NPfI to establish the RBLs at sensitive receivers.

Limited detail is available regarding details of mechanical upgrades associated with the development. The mechanical services design should be reviewed once finalised and will be subject to a separate SSDA application once detailed design has been completed.

No changes to traffic noise are predicted as a result of the development. No changes to the existing vibration levels are predicted as a result of the development.

Noise and vibration impacts from the construction of the development have been assessed in-principle in section 6 of the report in accordance with the ICNG. Construction Noise Management Levels (NMLs) have been established for sensitive receivers based on the established RBL.

A high level distance calculation has been used to predict a plausible range of LAeq,15min construction noise levels at sensitive receivers. The predicted LAeq,15min construction noise levels are could exceed both the NMLs and the Highly Noise Affected Level at numerous receivers in the vicinity of the site. It is therefore recommended that a CNVMP be developed for the site and that all reasonable and feasible measures be implemented to minimise construction noise and vibration impacts.

8 STATEMENT OF LIMITATIONS

This report entitled Powerhouse Ultimo Renewal was prepared by RWDI Australia ("RWDI") for Create NSW ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared. Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.



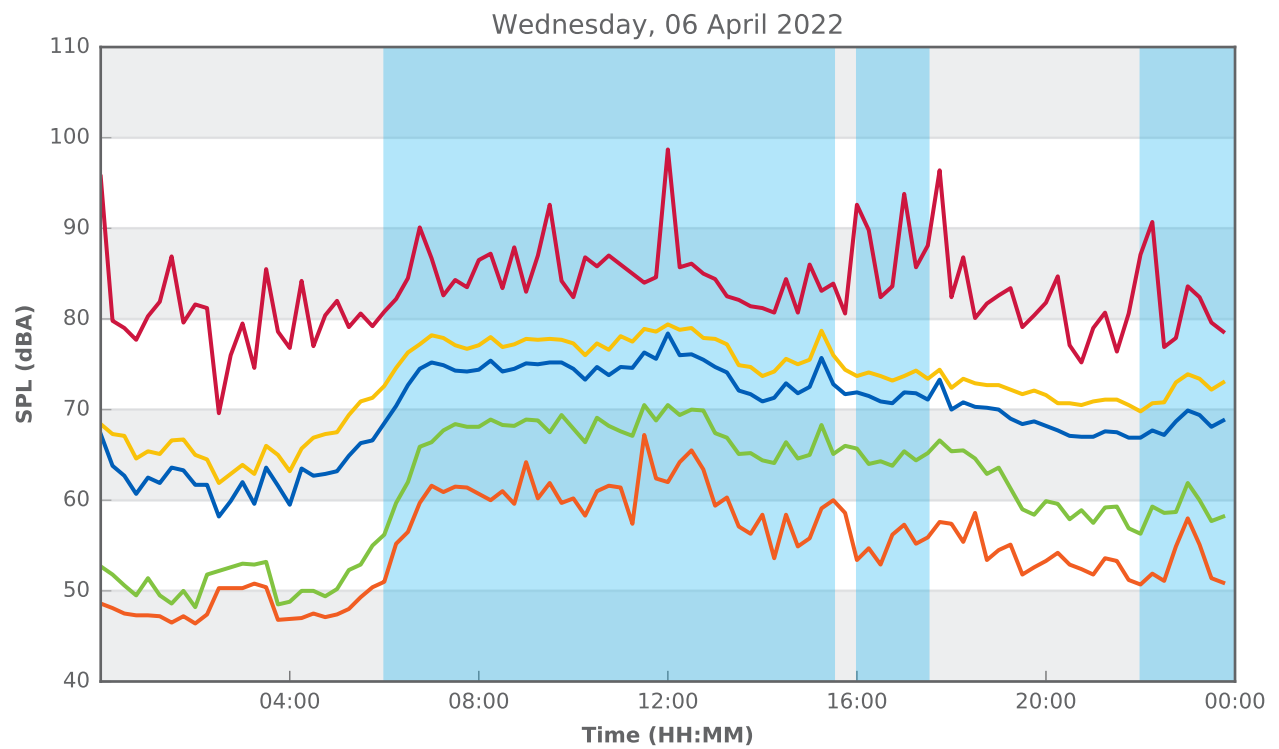
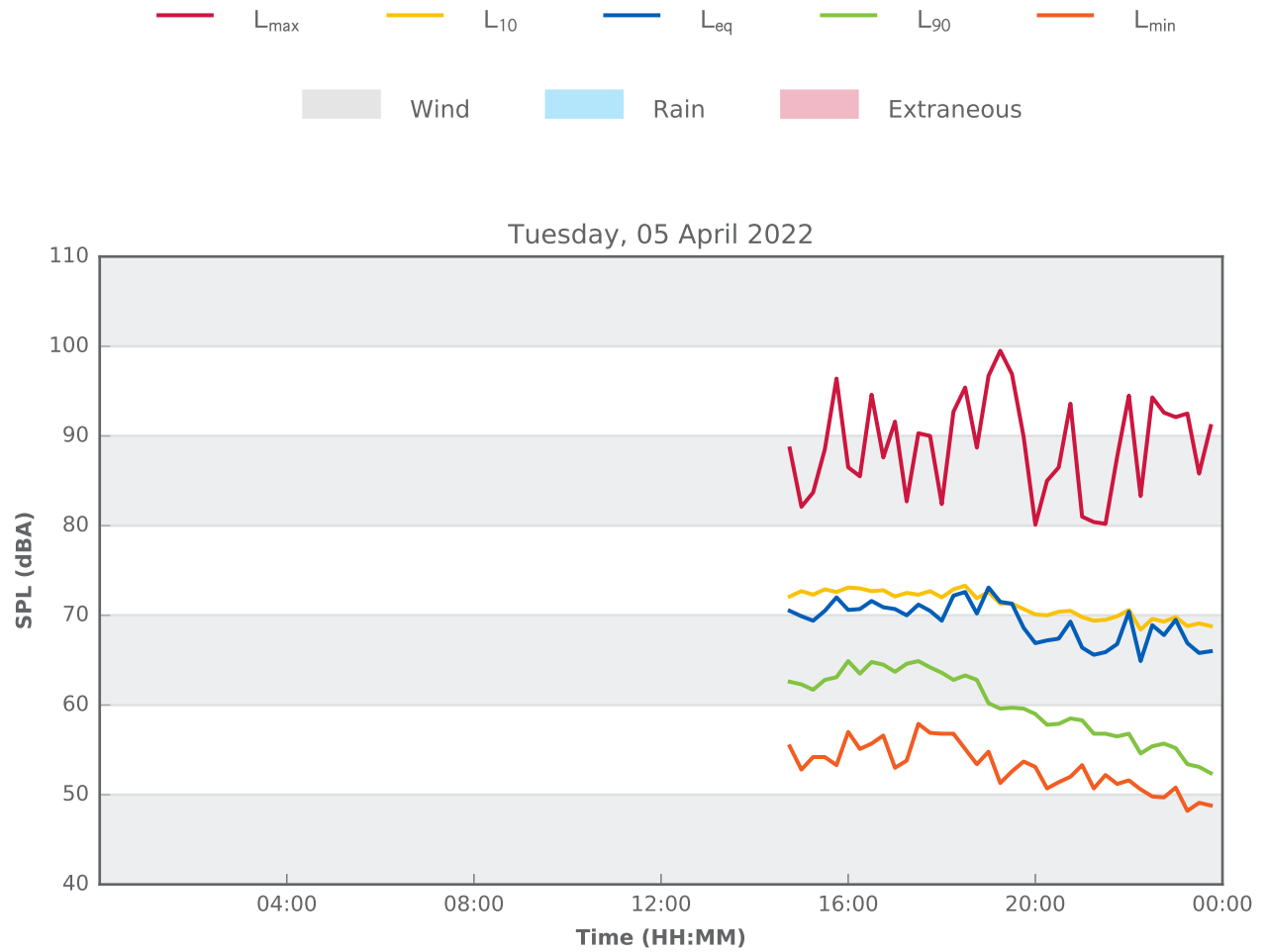
9 REFERENCES

1. Environment Protection Authority. (2017a). *Noise Policy for Industry*. www.epa.nsw.gov.au
2. Environment Protection Authority. (2017b). *Noise Policy for Industry* (pp. 7–20). www.epa.nsw.gov.au
3. State of NSW and Department of Environment & Climate Change NSW. (2011). *Road Noise Policy*. www.epa.nsw.gov.au
4. State of NSW and Department of Environment & Climate Change NSW. (2009). *Interim Construction Noise Guideline*. www.environment.nsw.gov.au

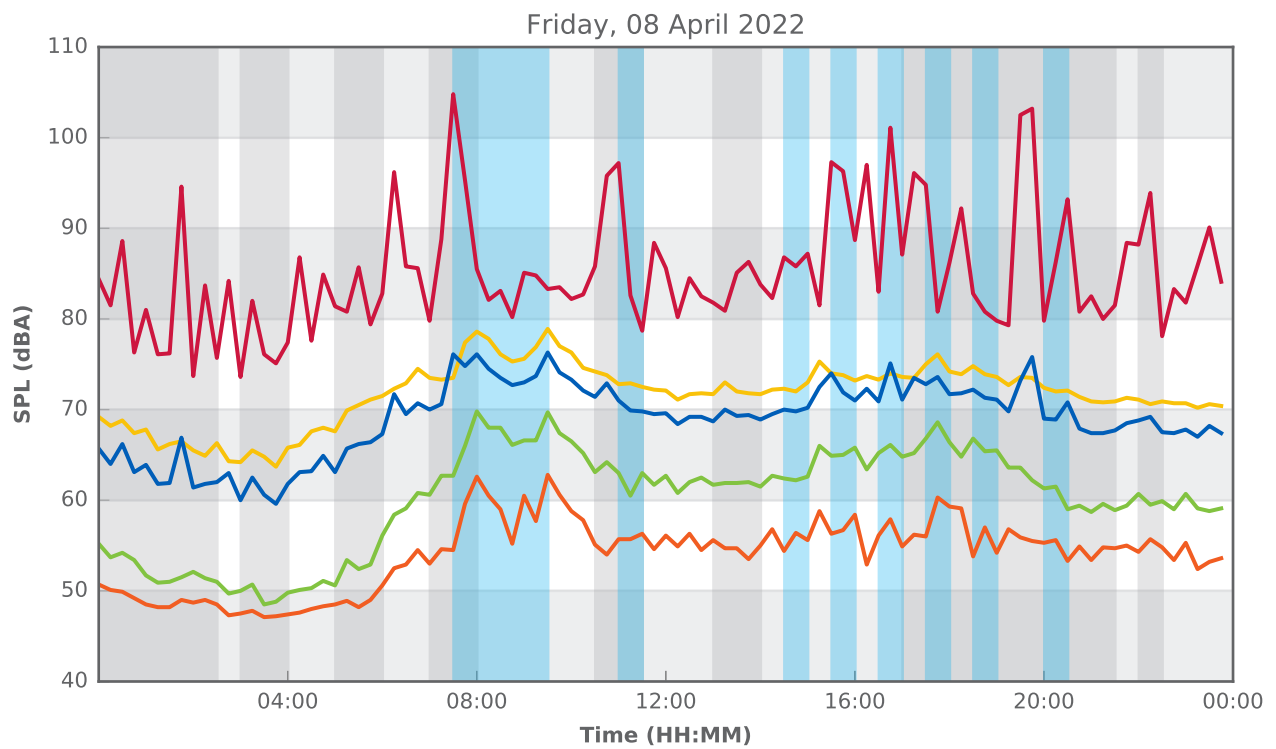
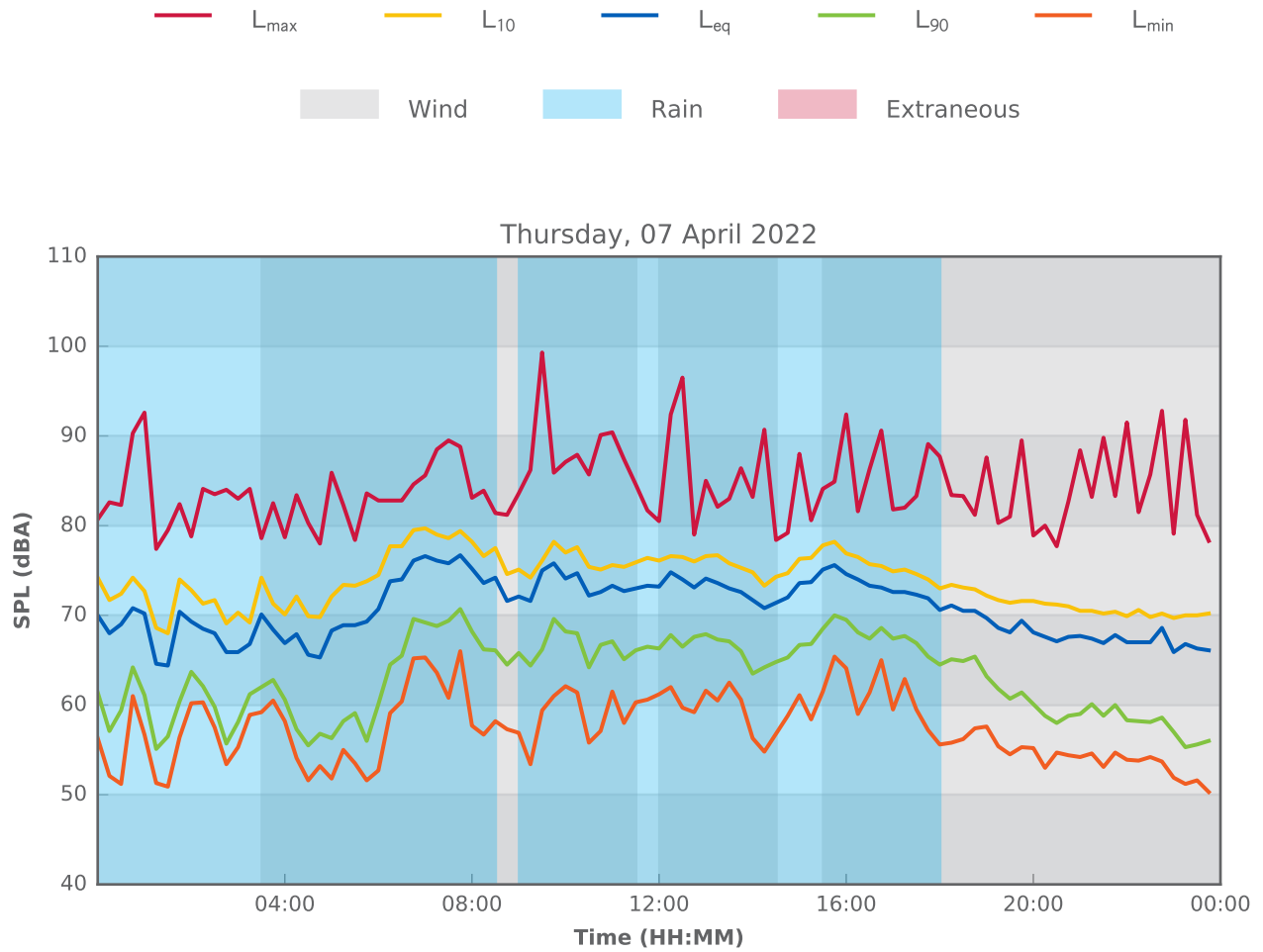
A large, light beige curved shape on the right side of the page, with a blue triangular shape in the top-left corner, separated by a white curved line.

Appendix A Unattended Noise Monitoring Graphs

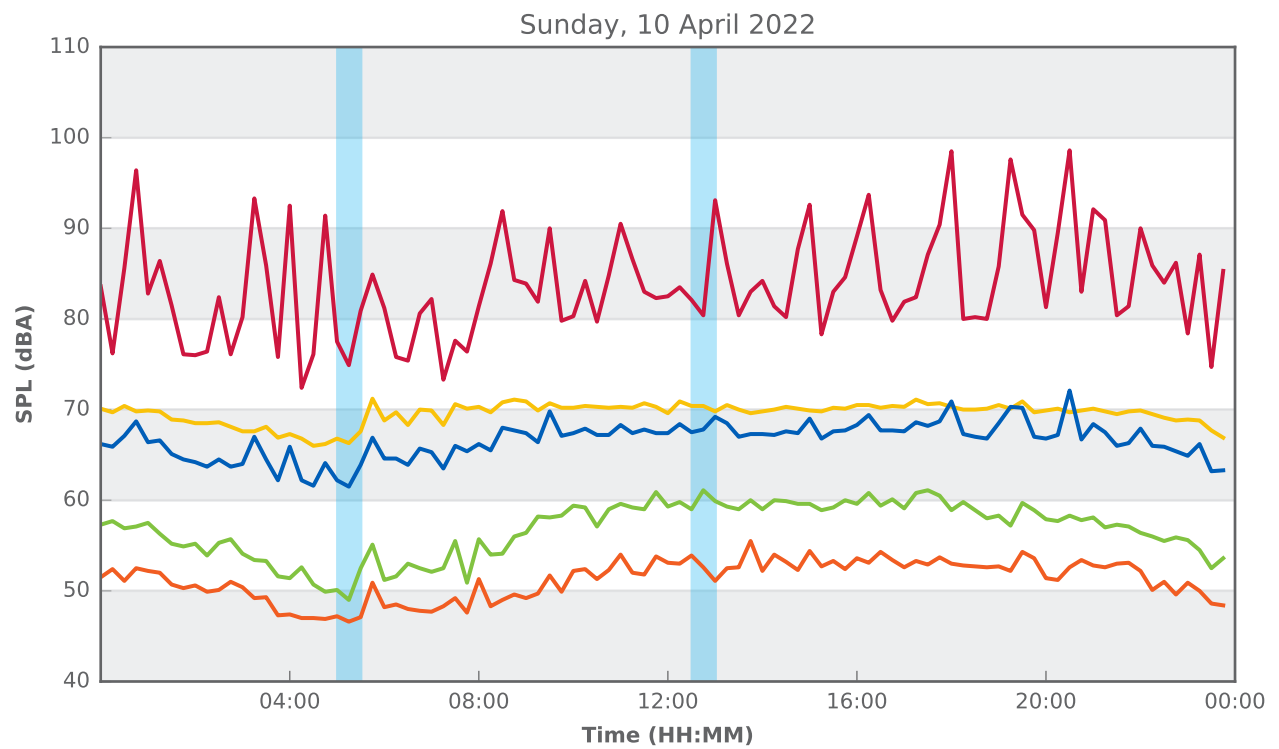
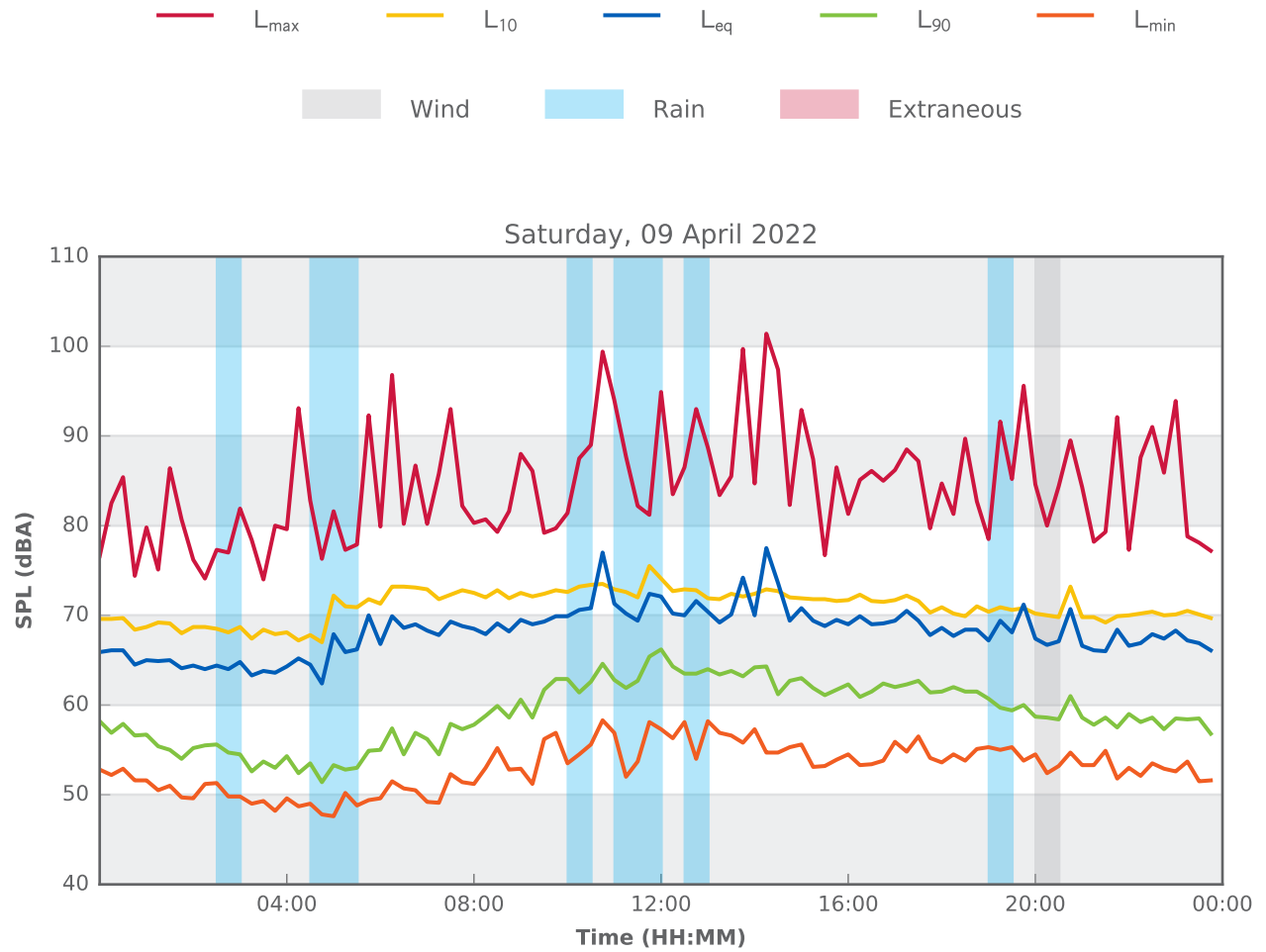
U1 - Harris Street near Old Post Office



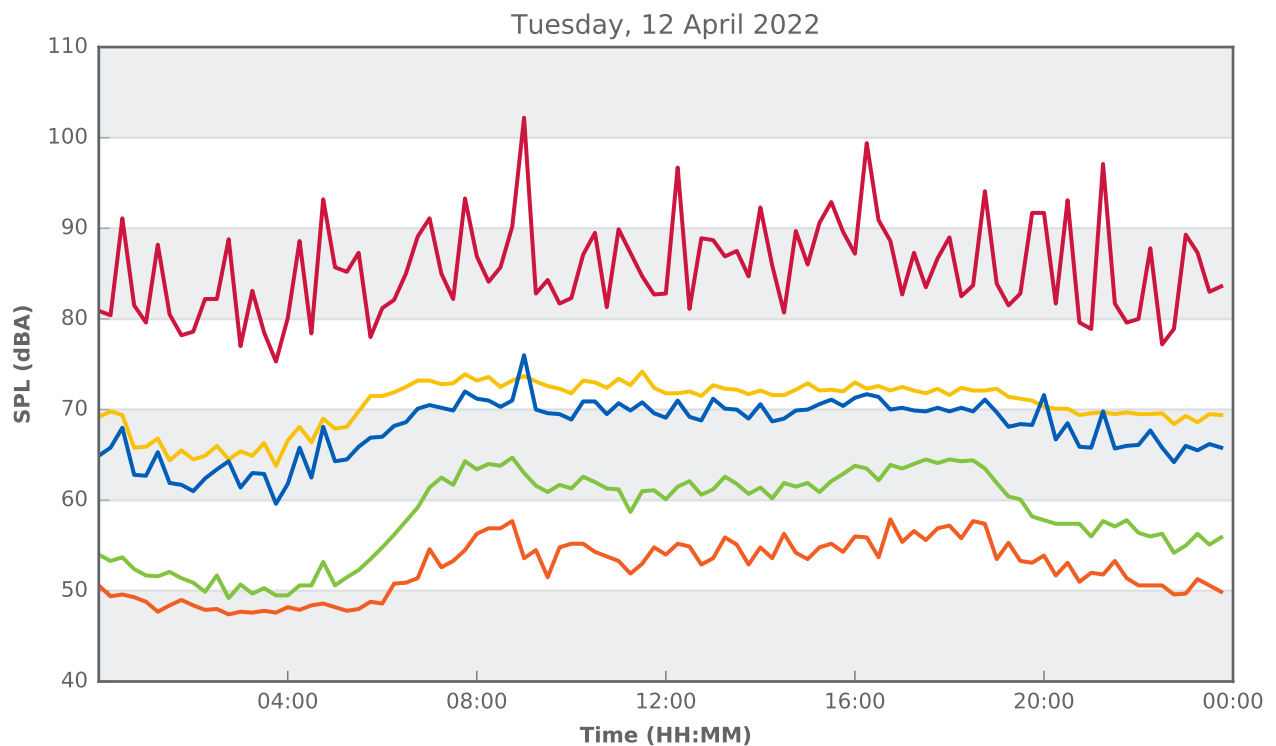
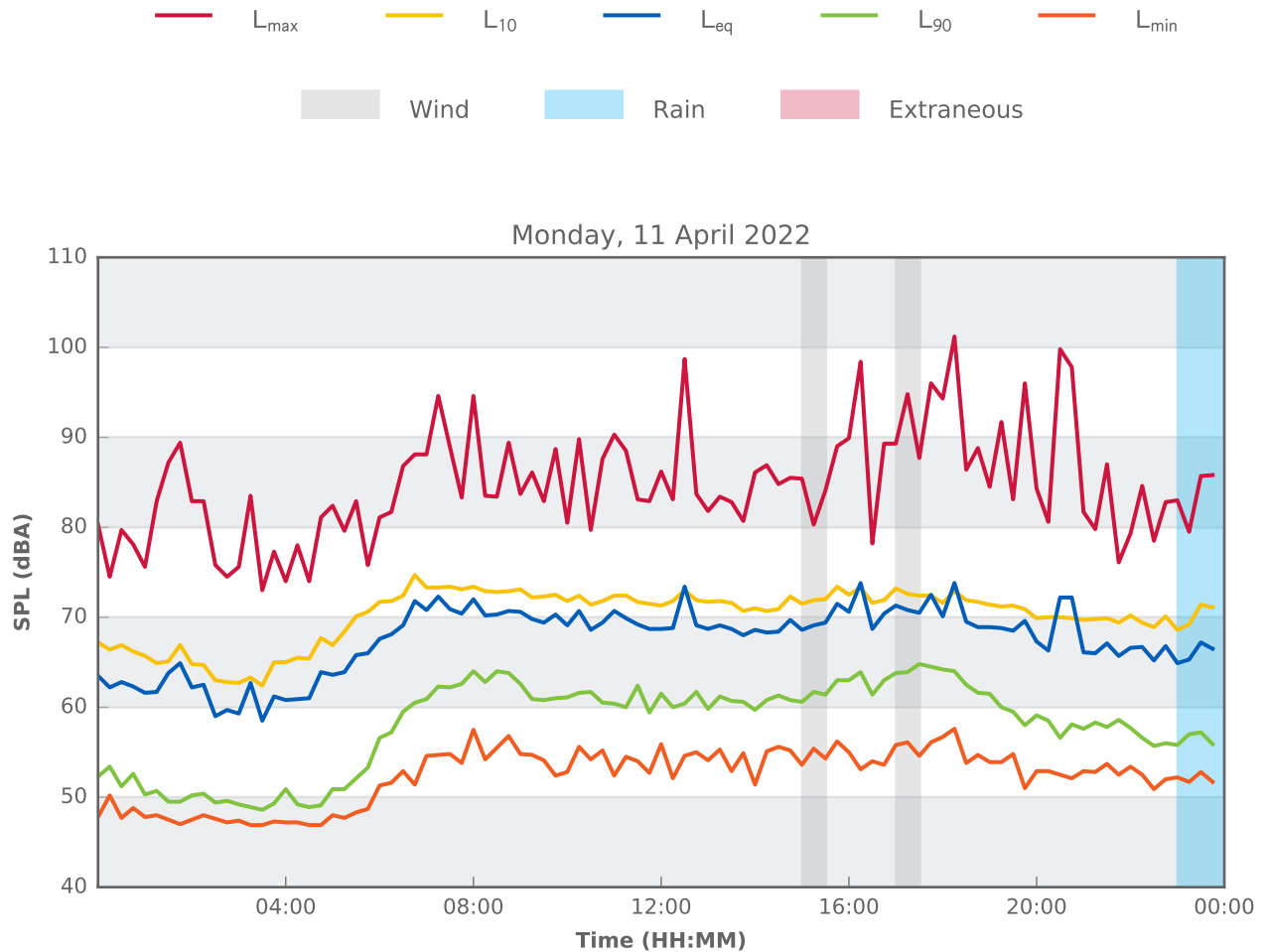
U1 - Harris Street near Old Post Office



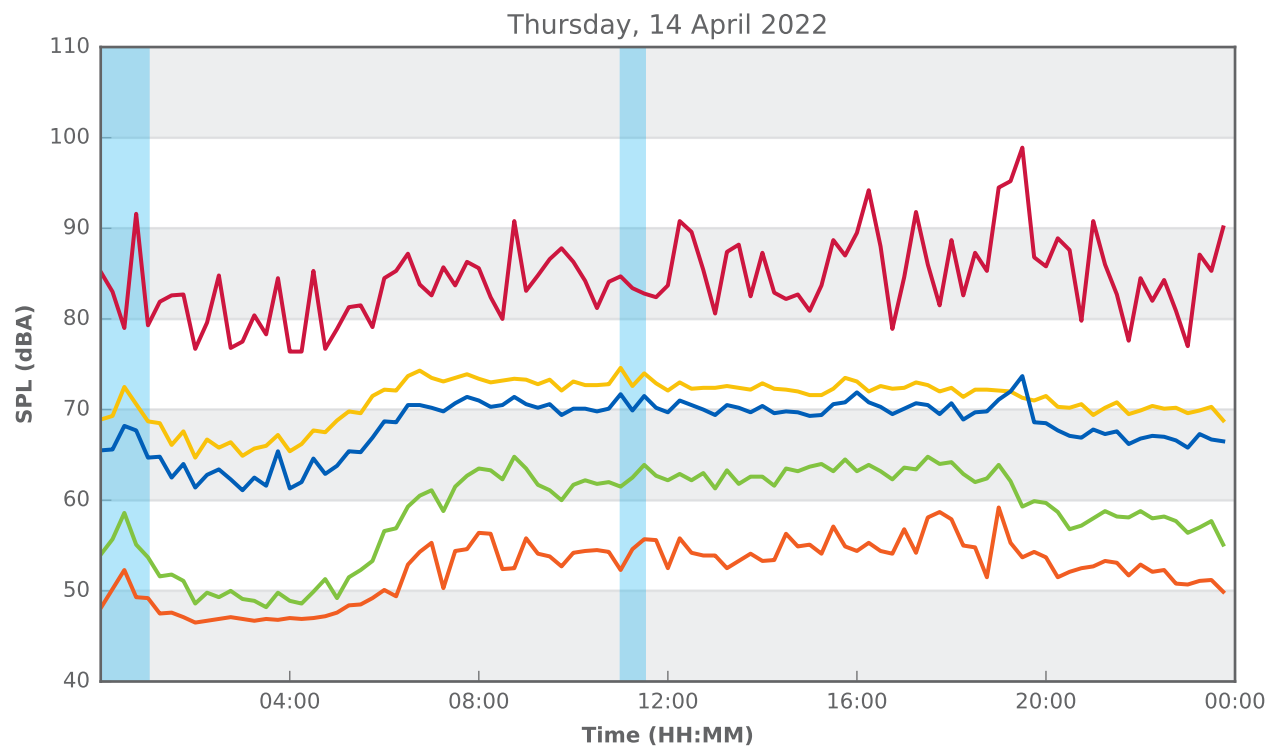
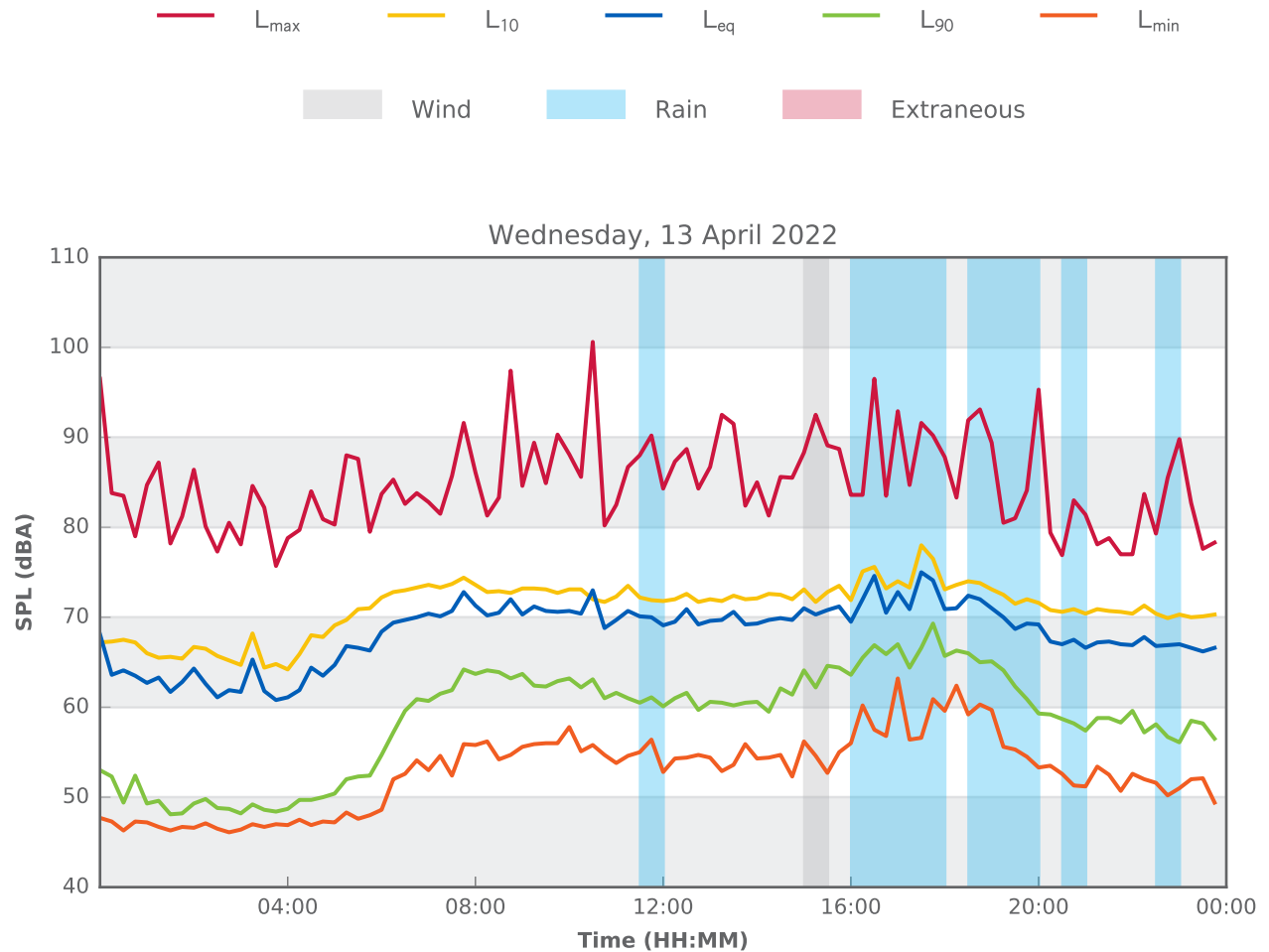
U1 - Harris Street near Old Post Office



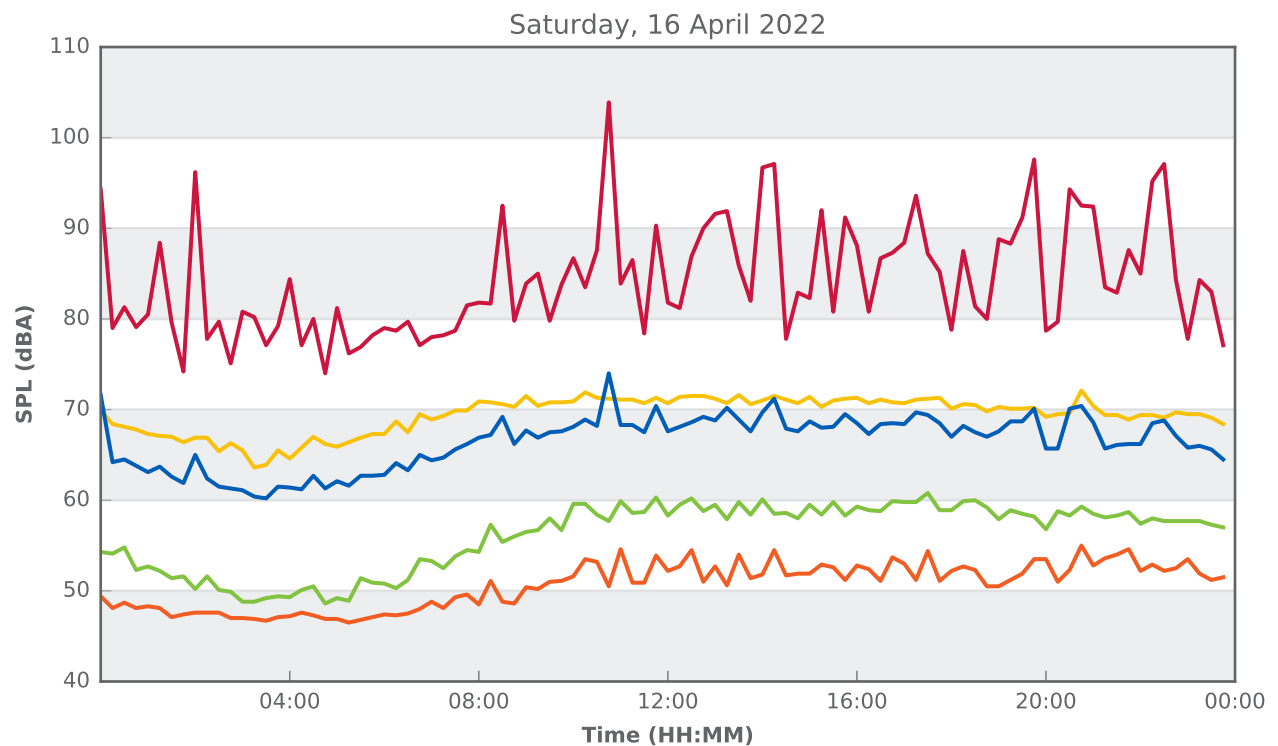
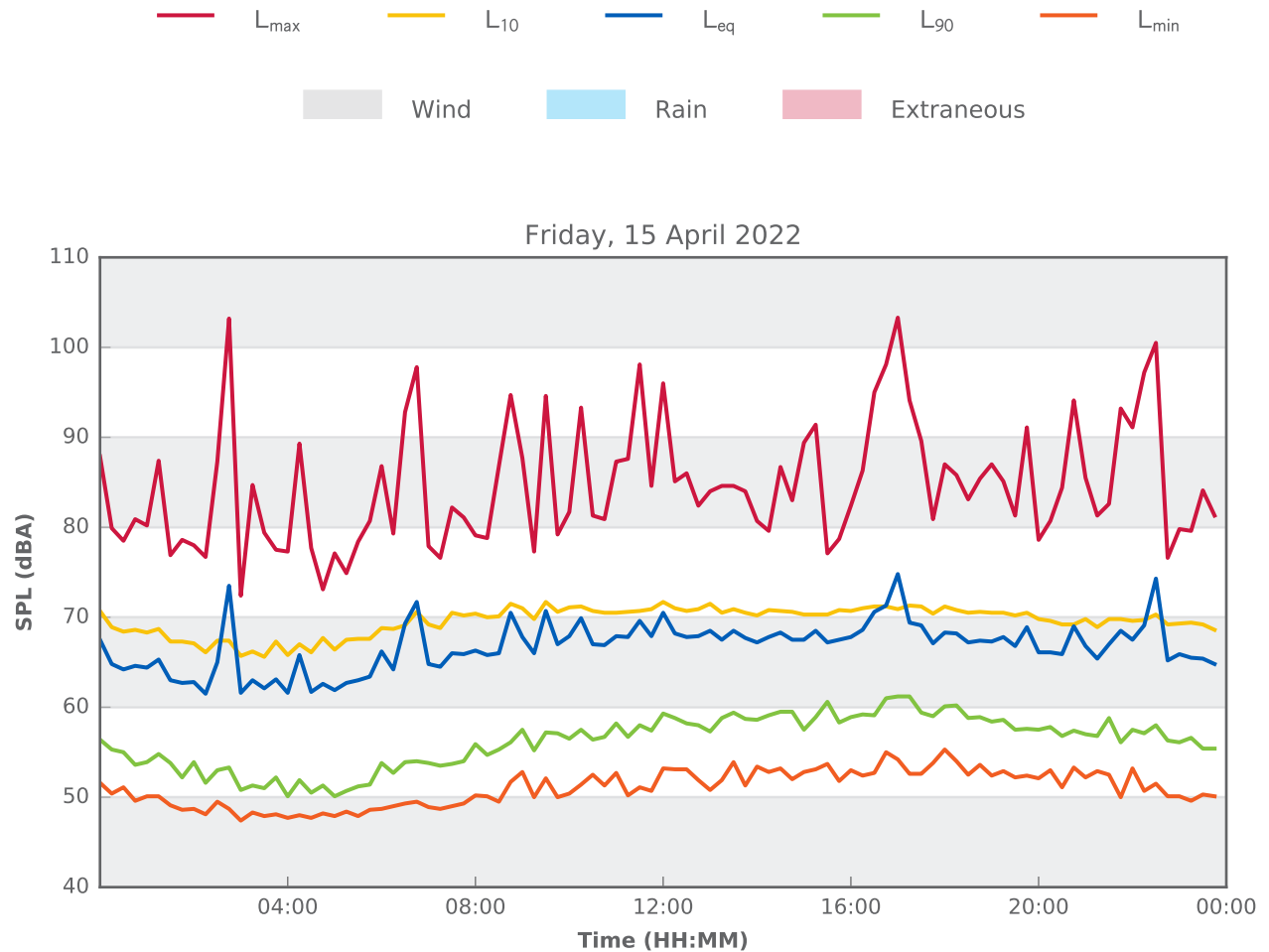
U1 - Harris Street near Old Post Office



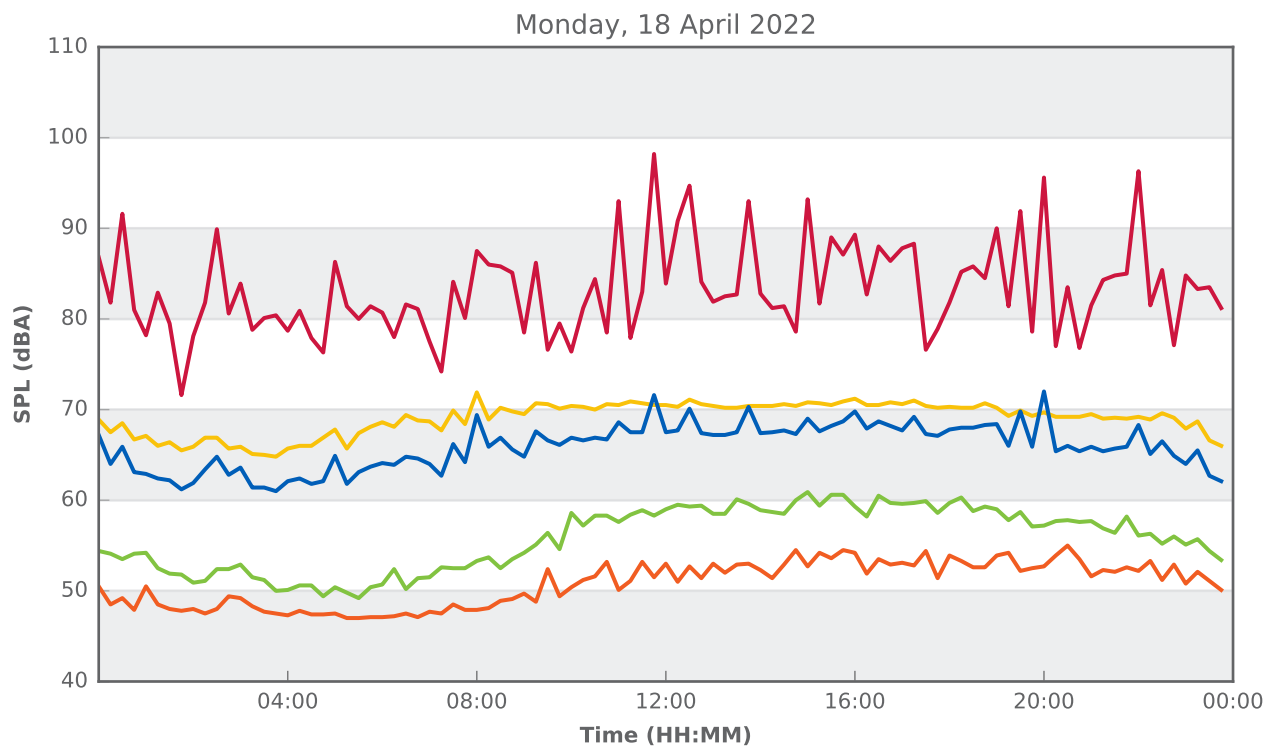
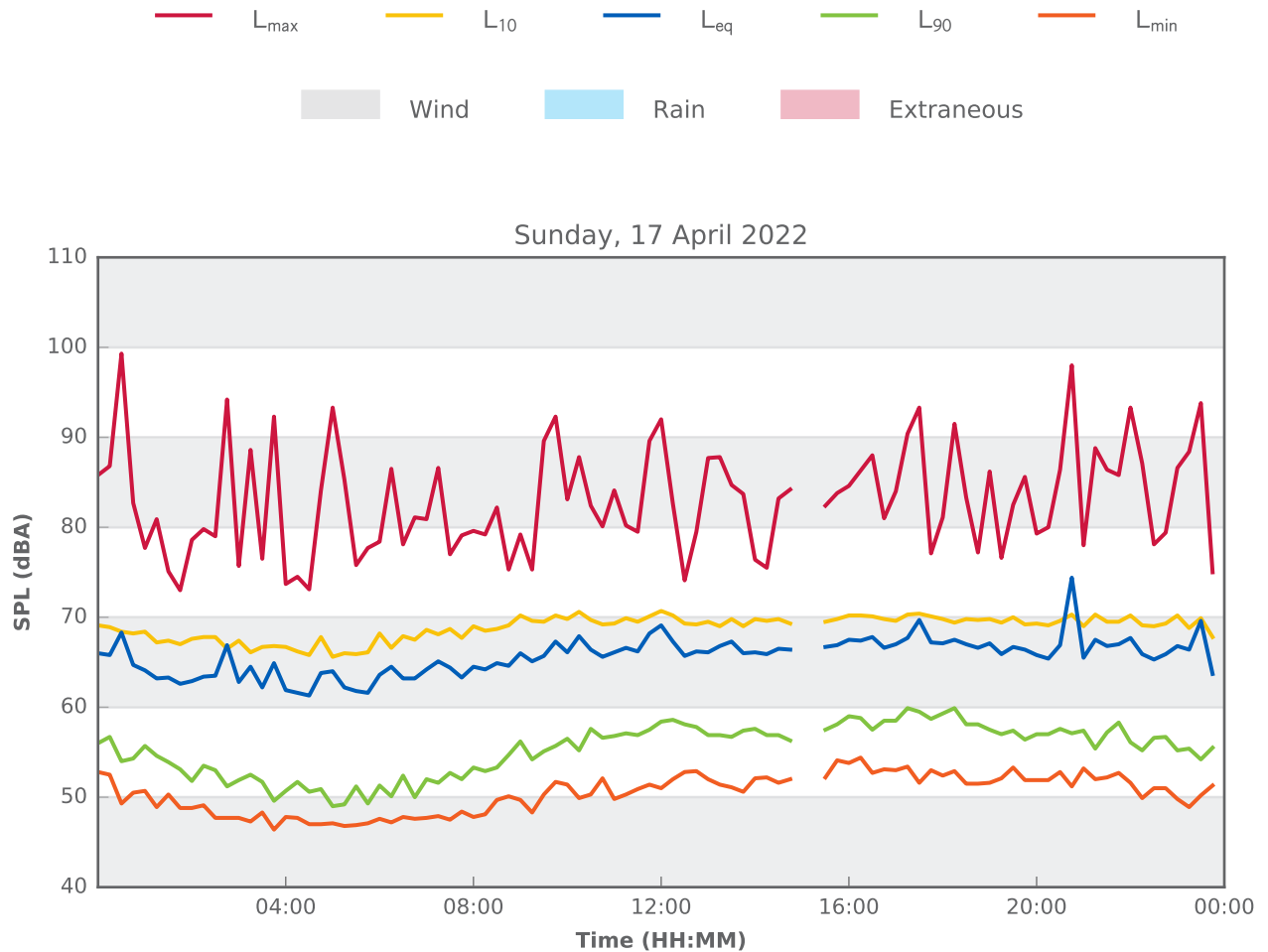
U1 - Harris Street near Old Post Office



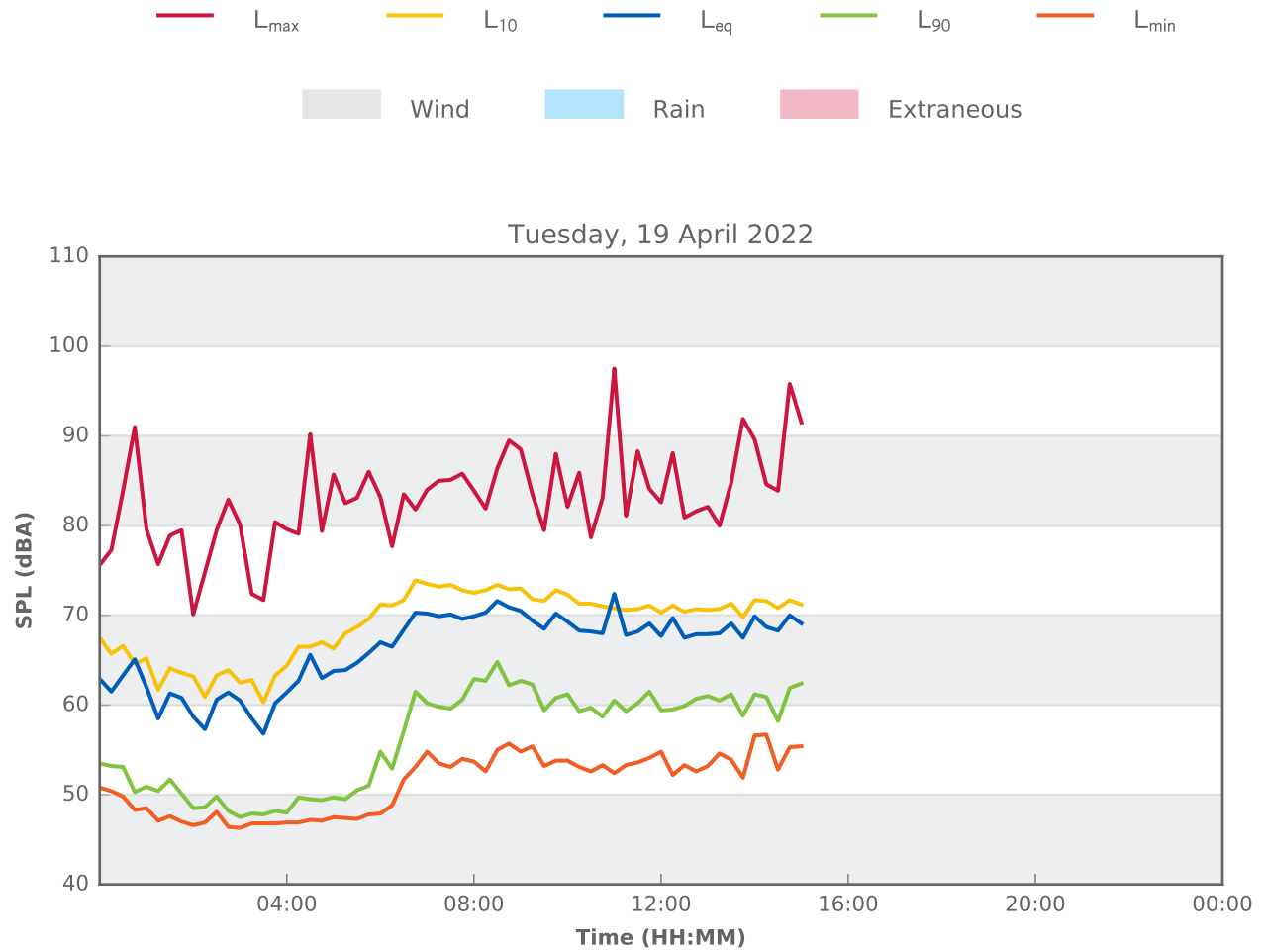
U1 - Harris Street near Old Post Office



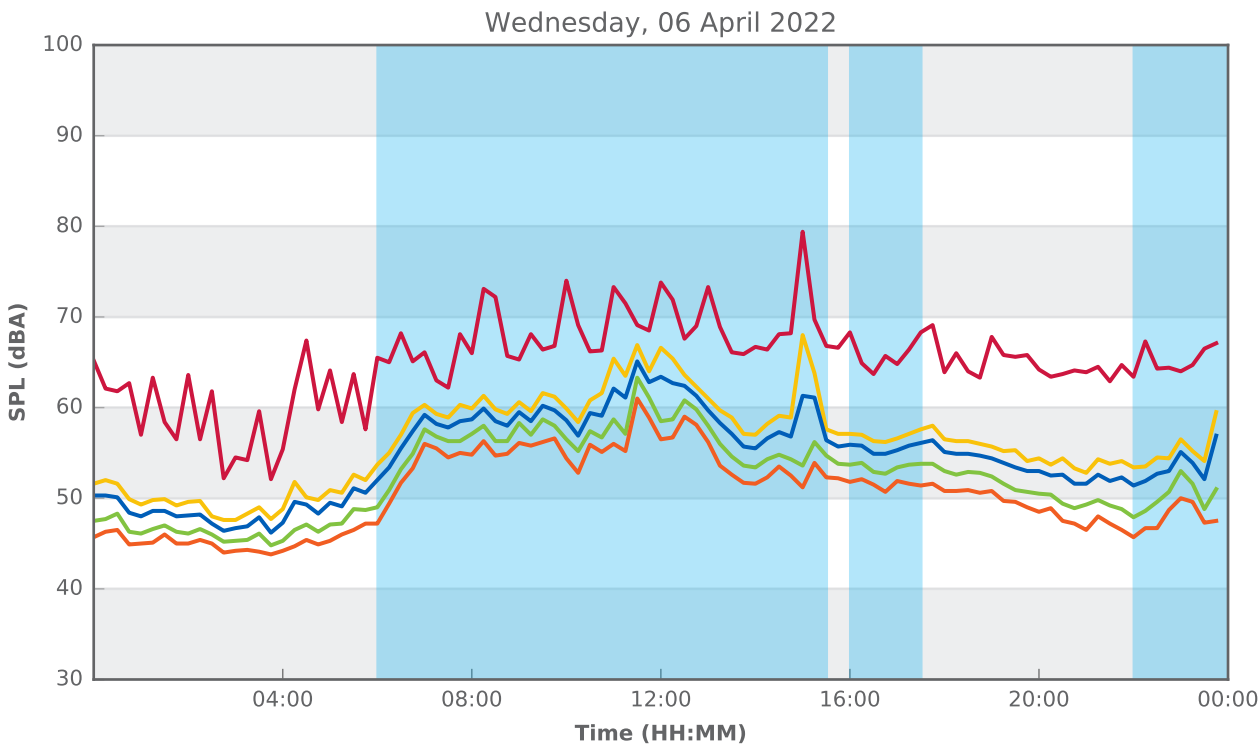
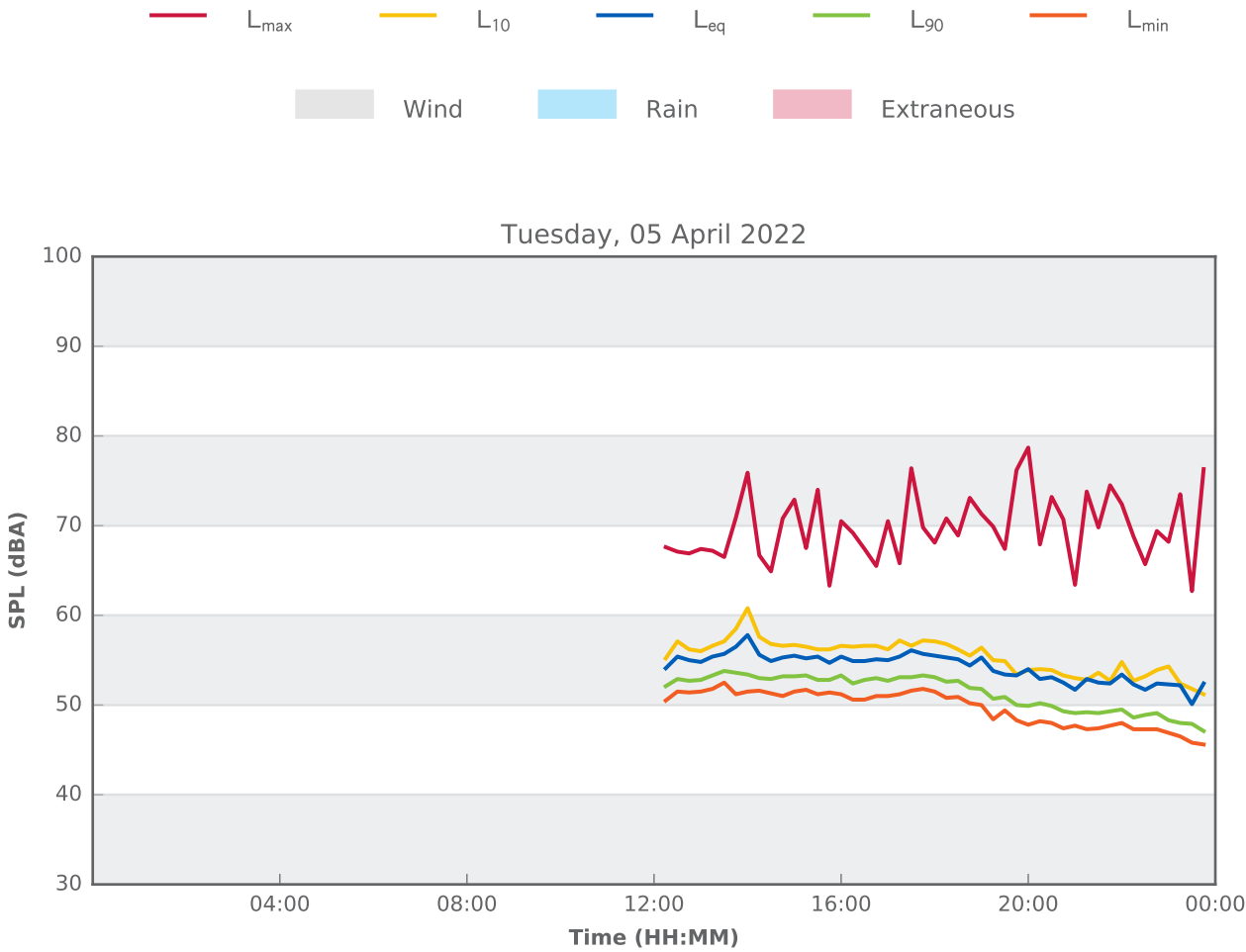
U1 - Harris Street near Old Post Office



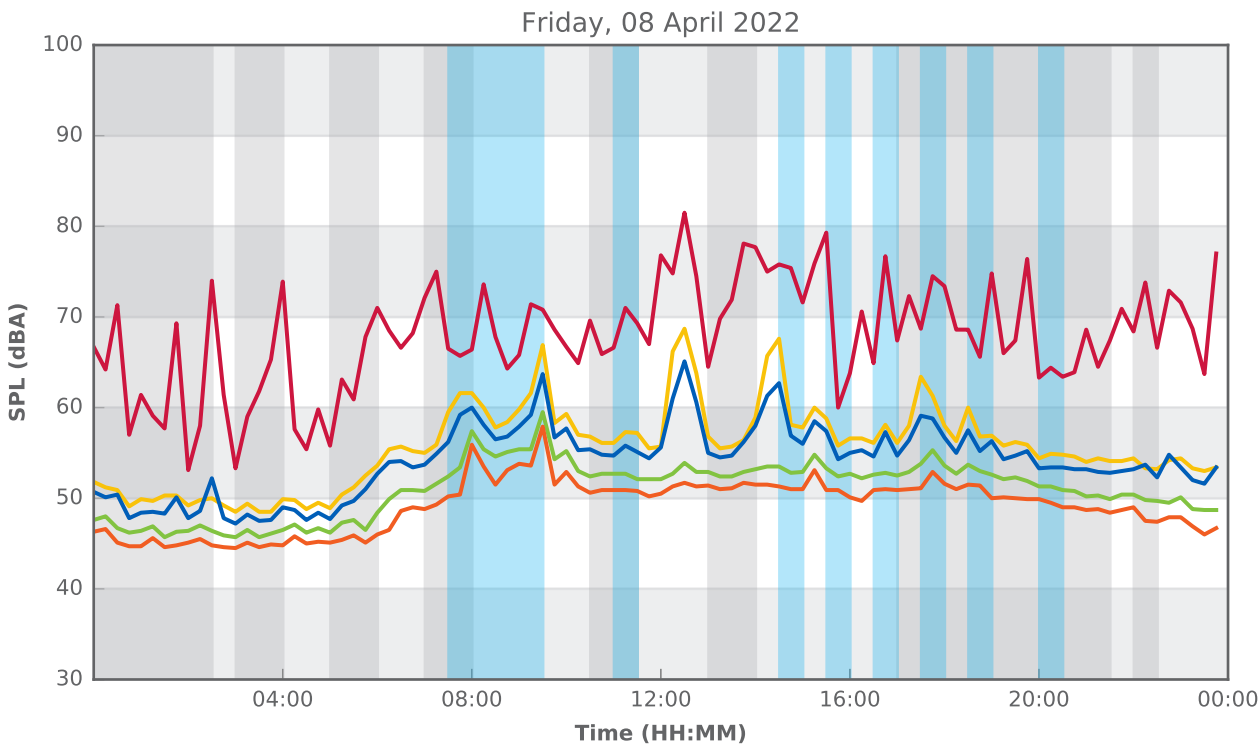
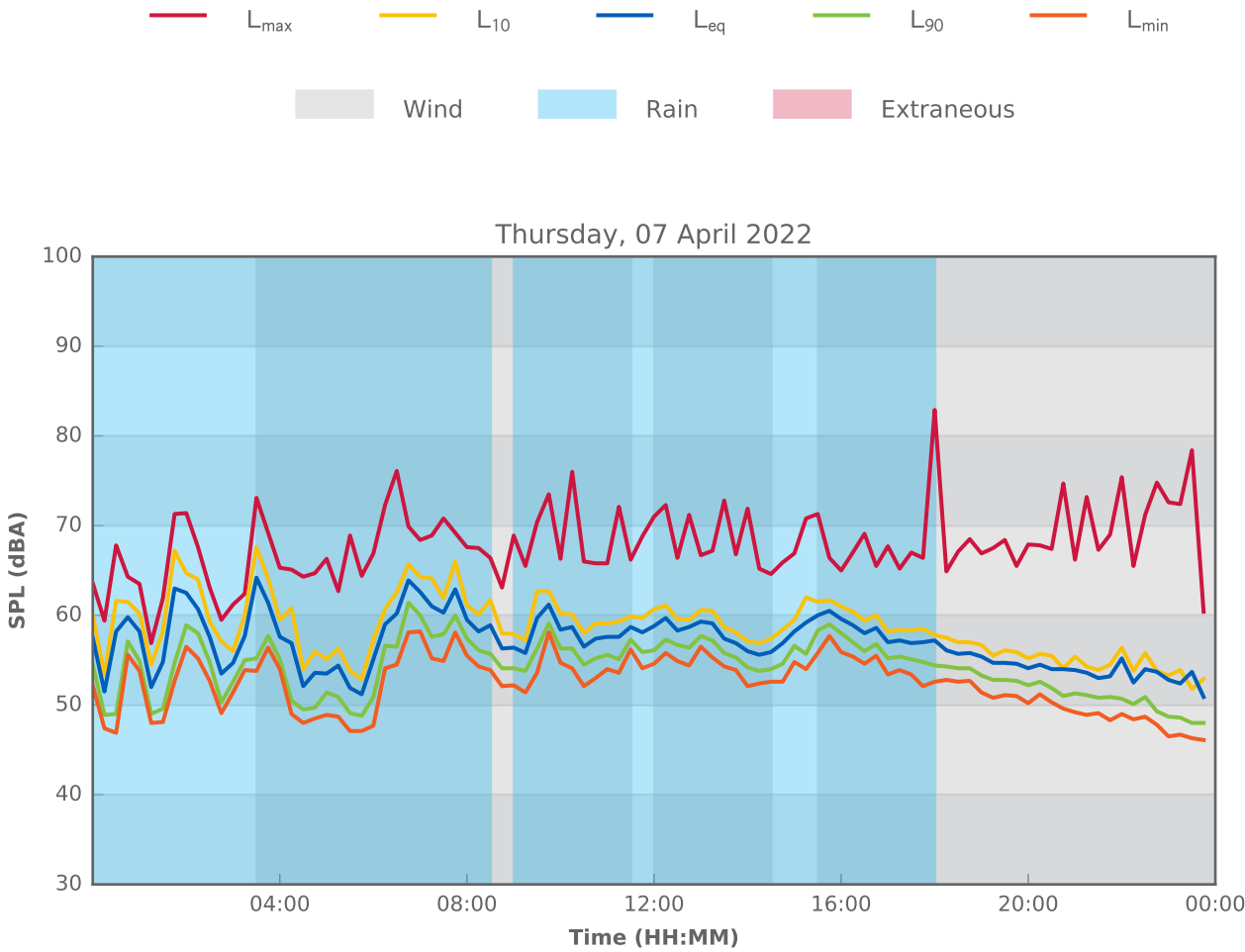
U1 - Harris Street near Old Post Office



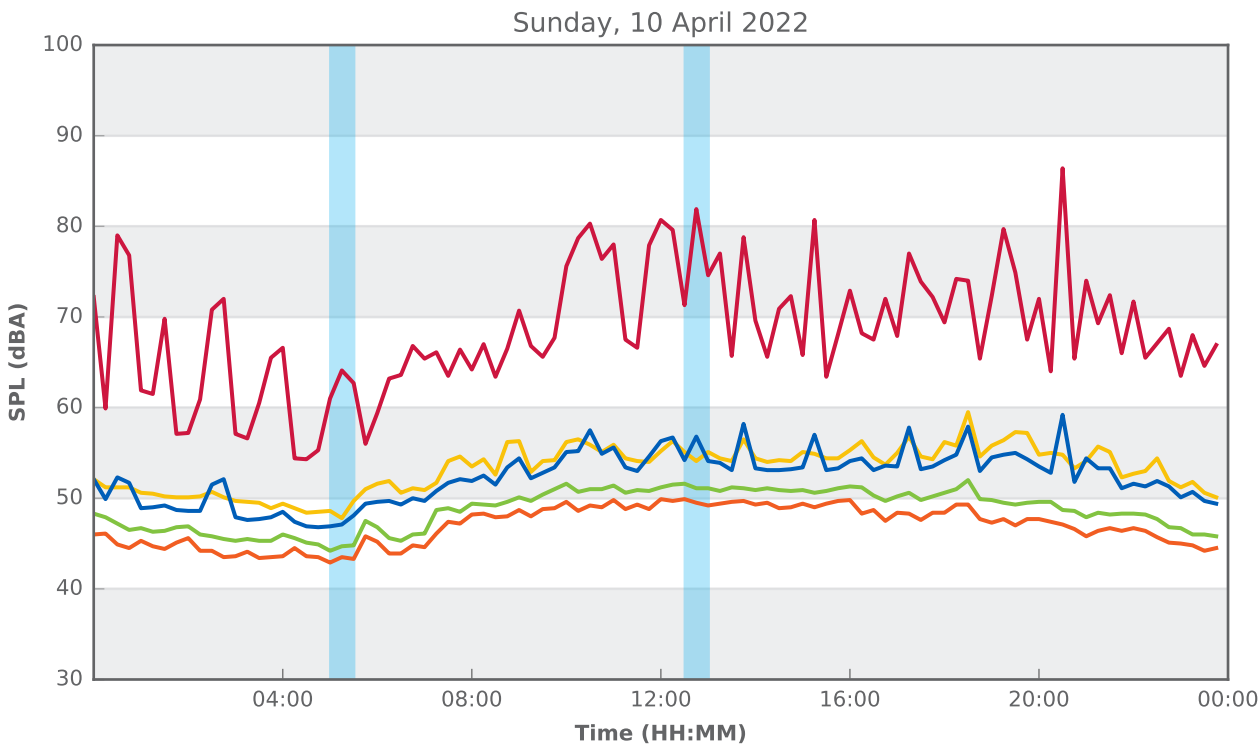
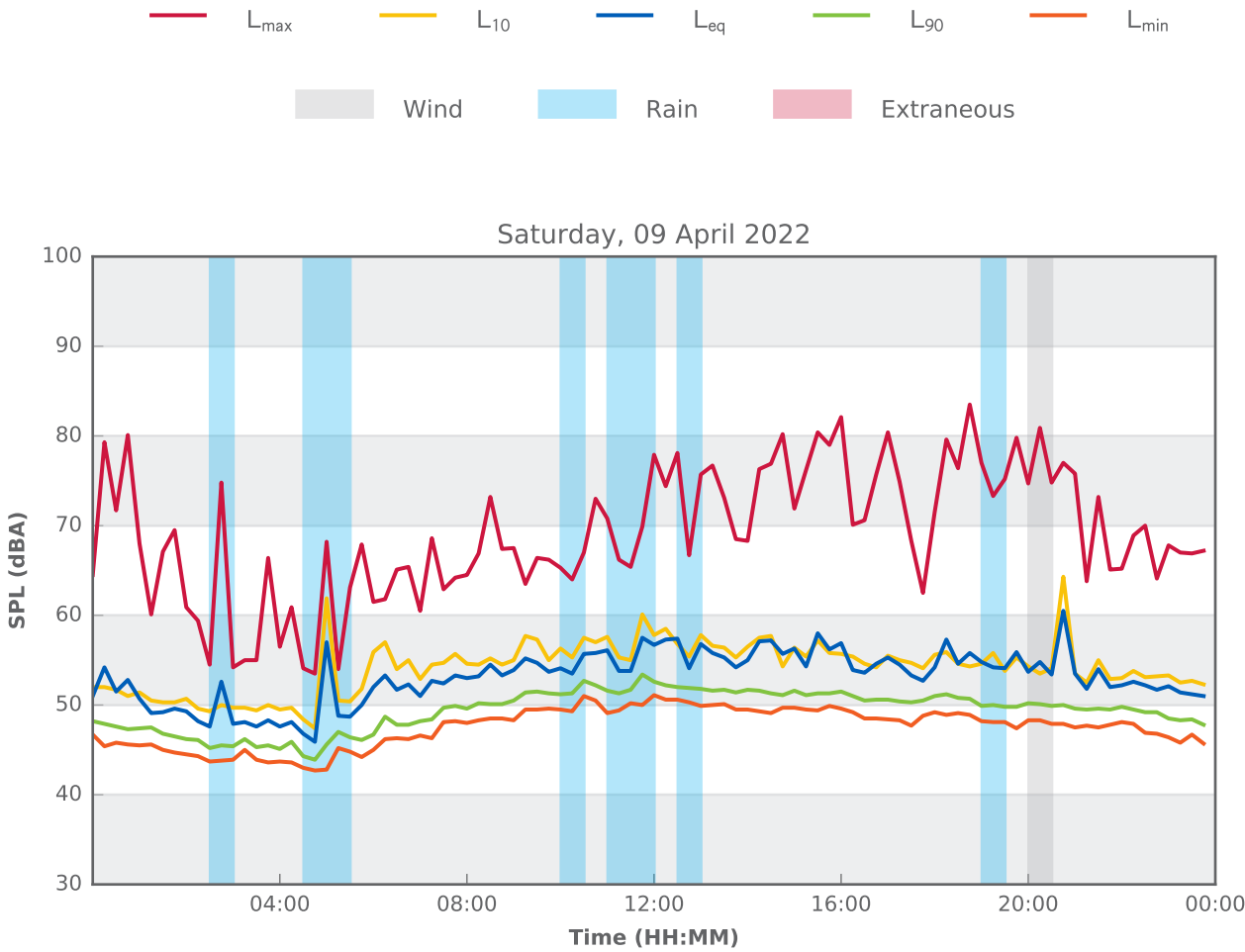
U2 - Cafe Rooftop



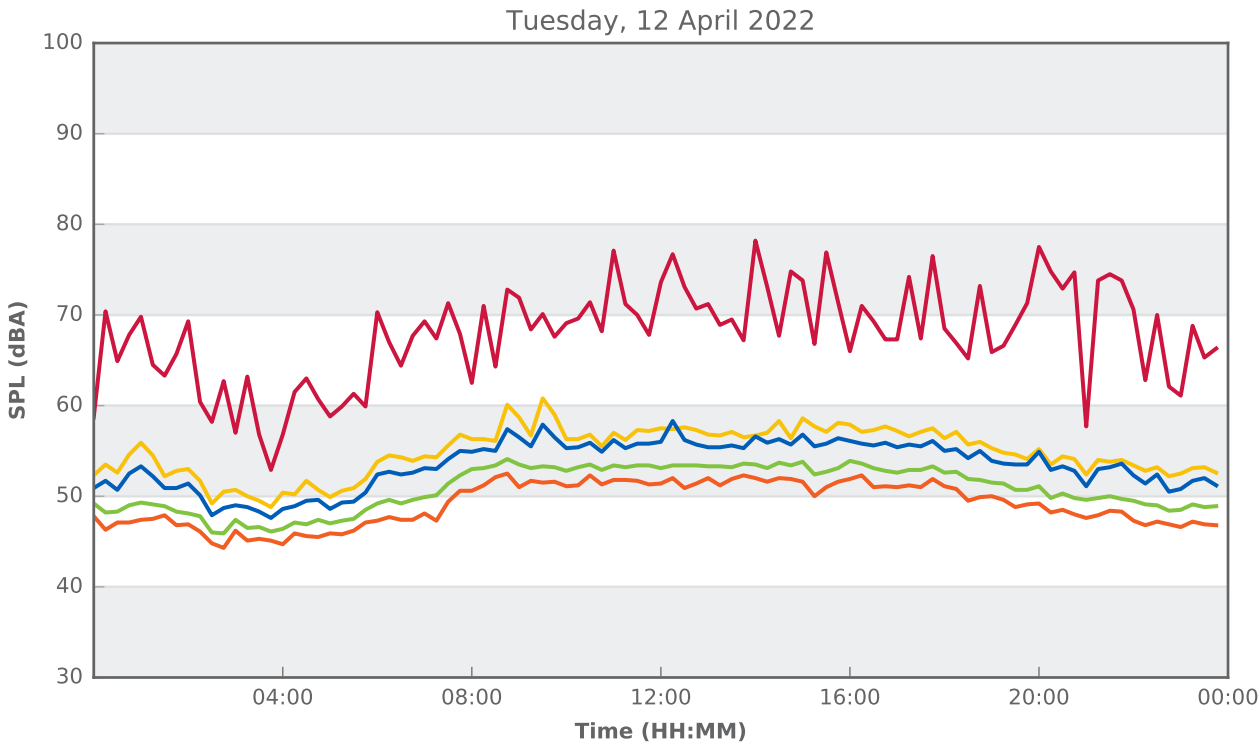
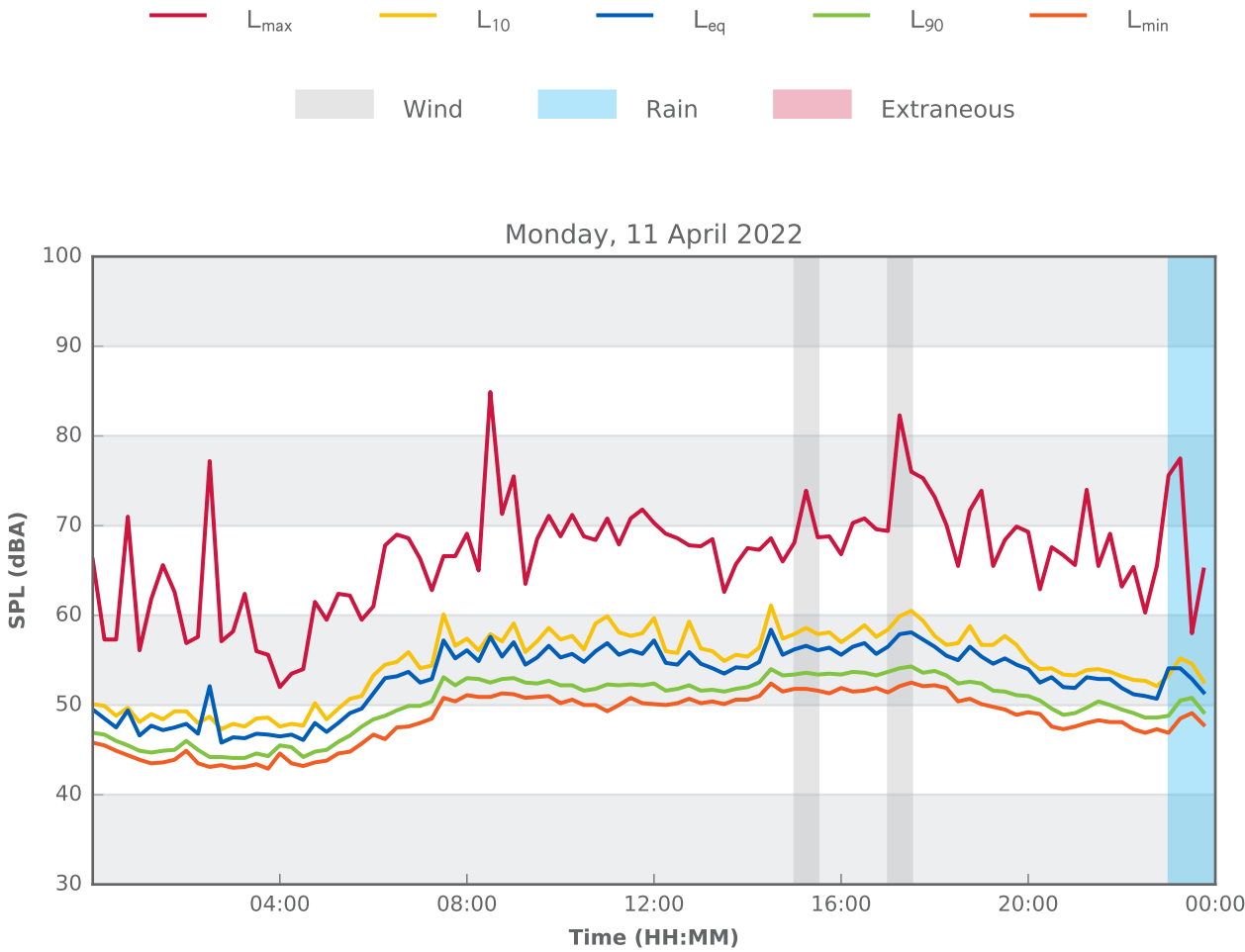
U2 - Cafe Rooftop



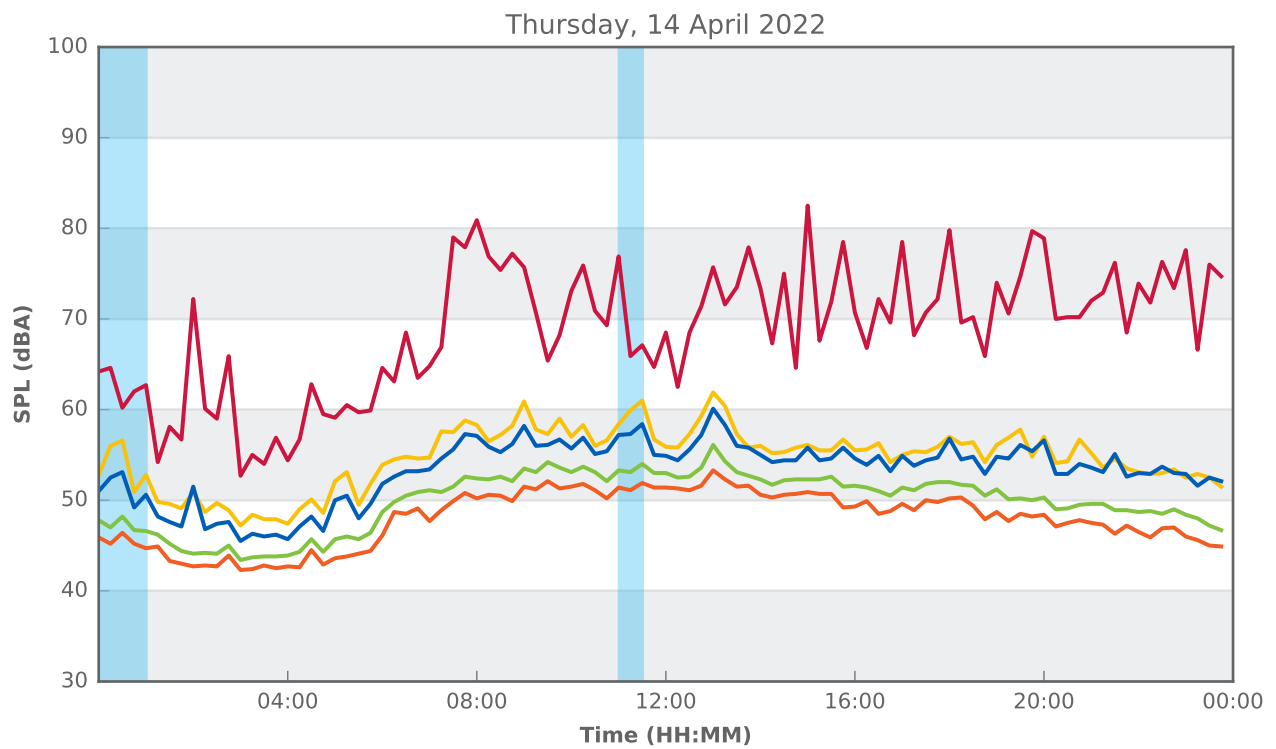
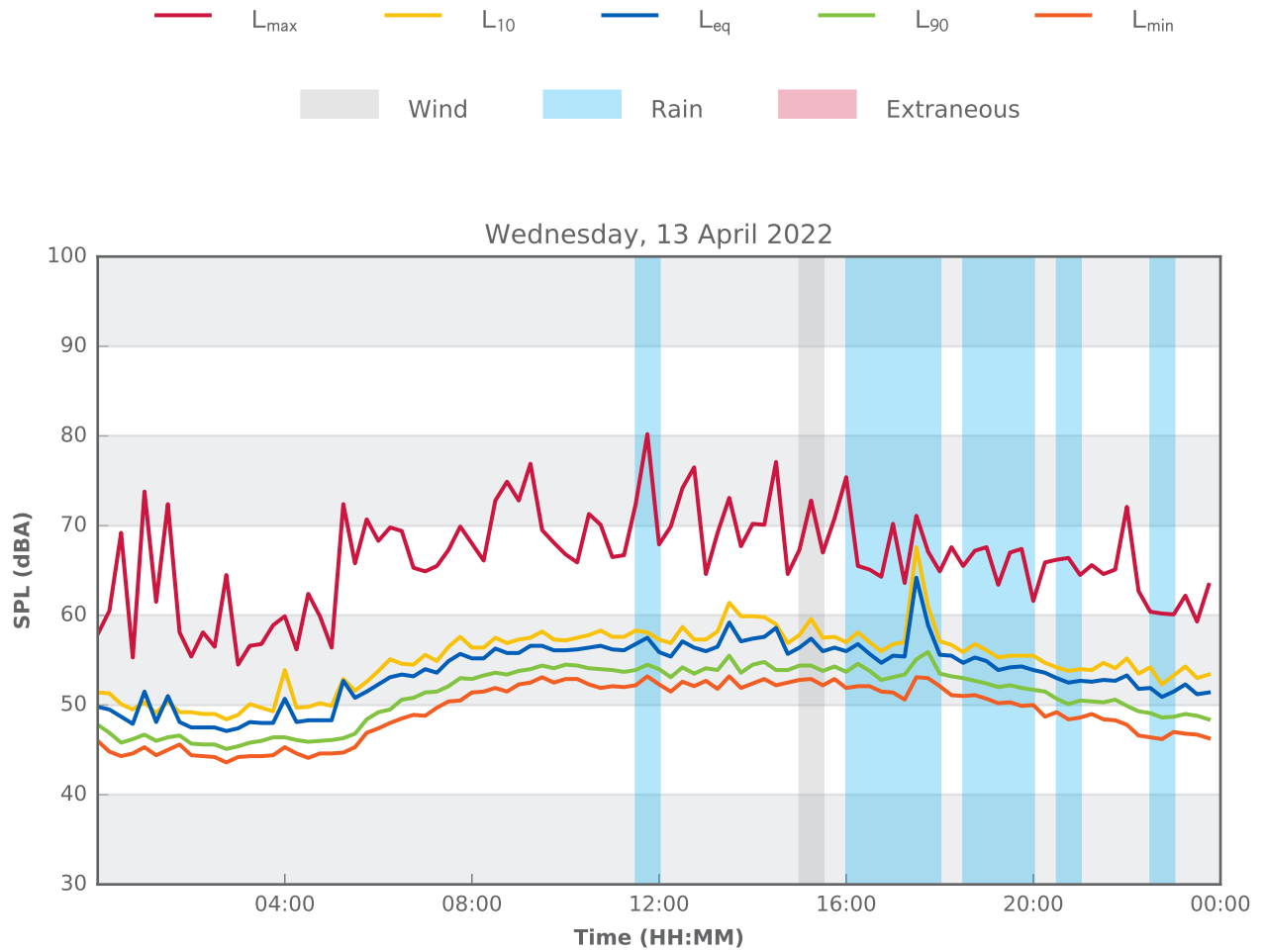
U2 - Cafe Rooftop



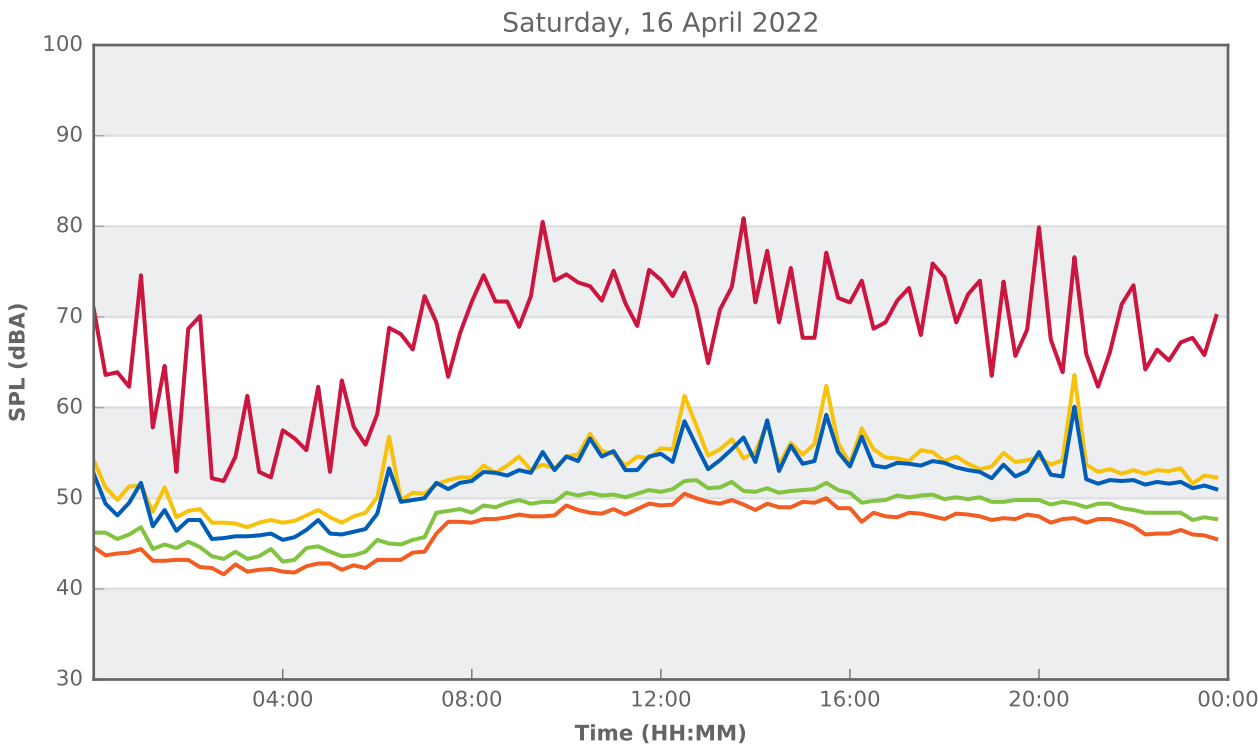
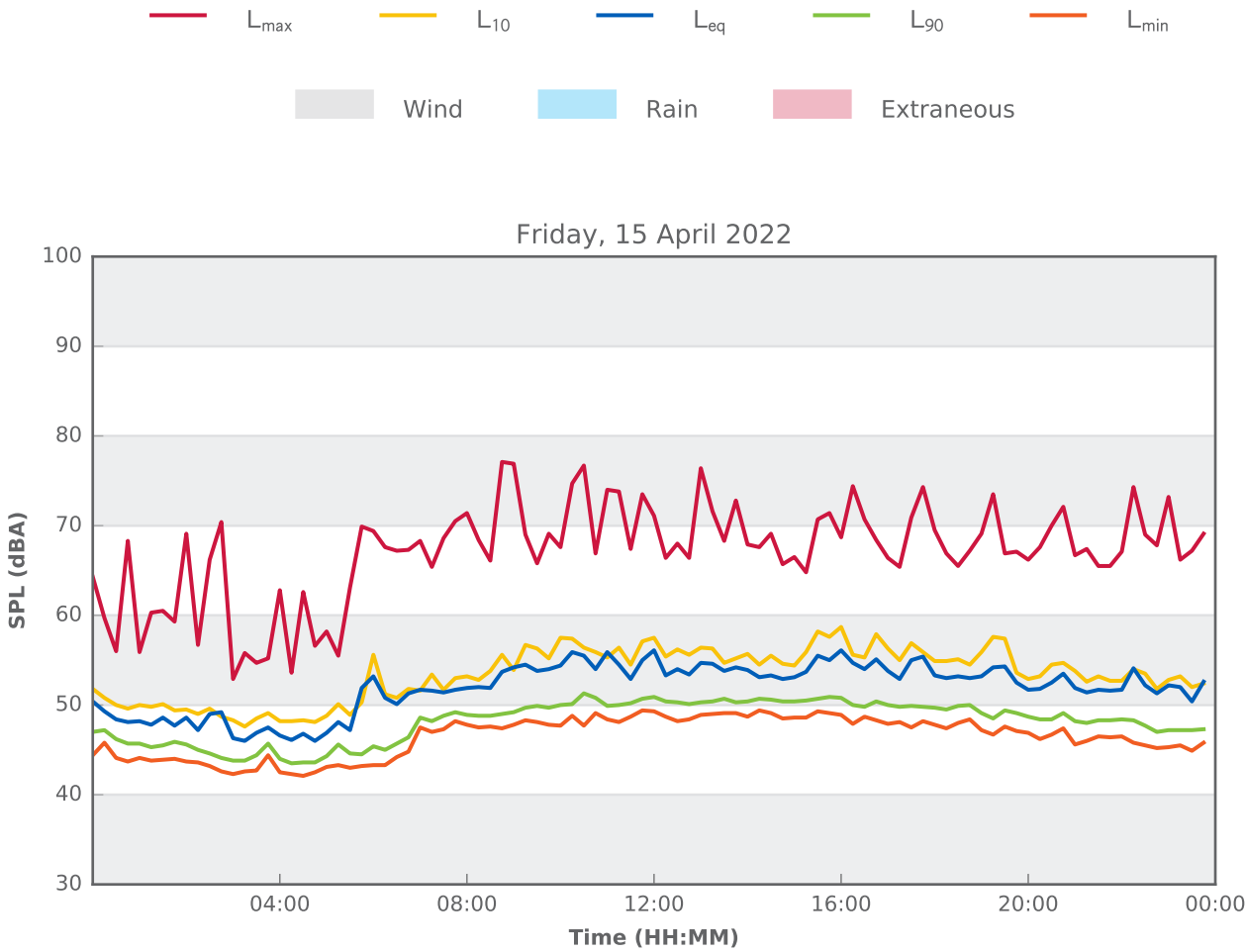
U2 - Cafe Rooftop



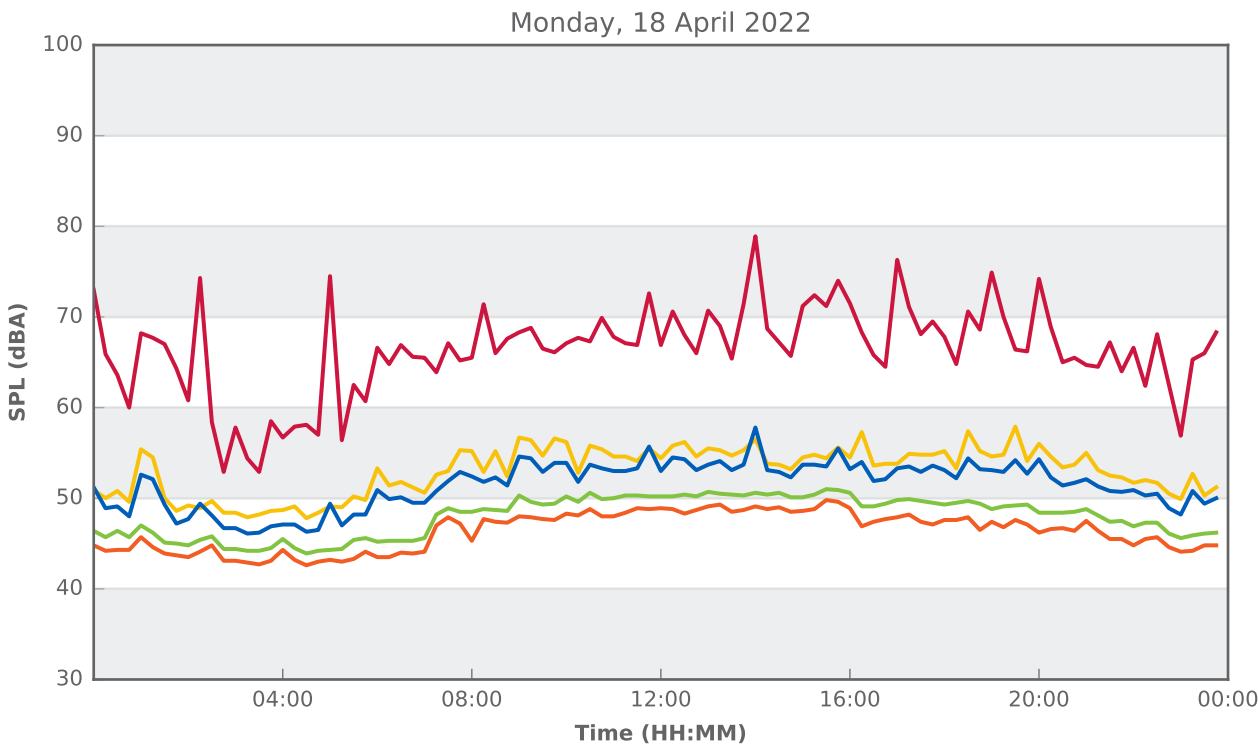
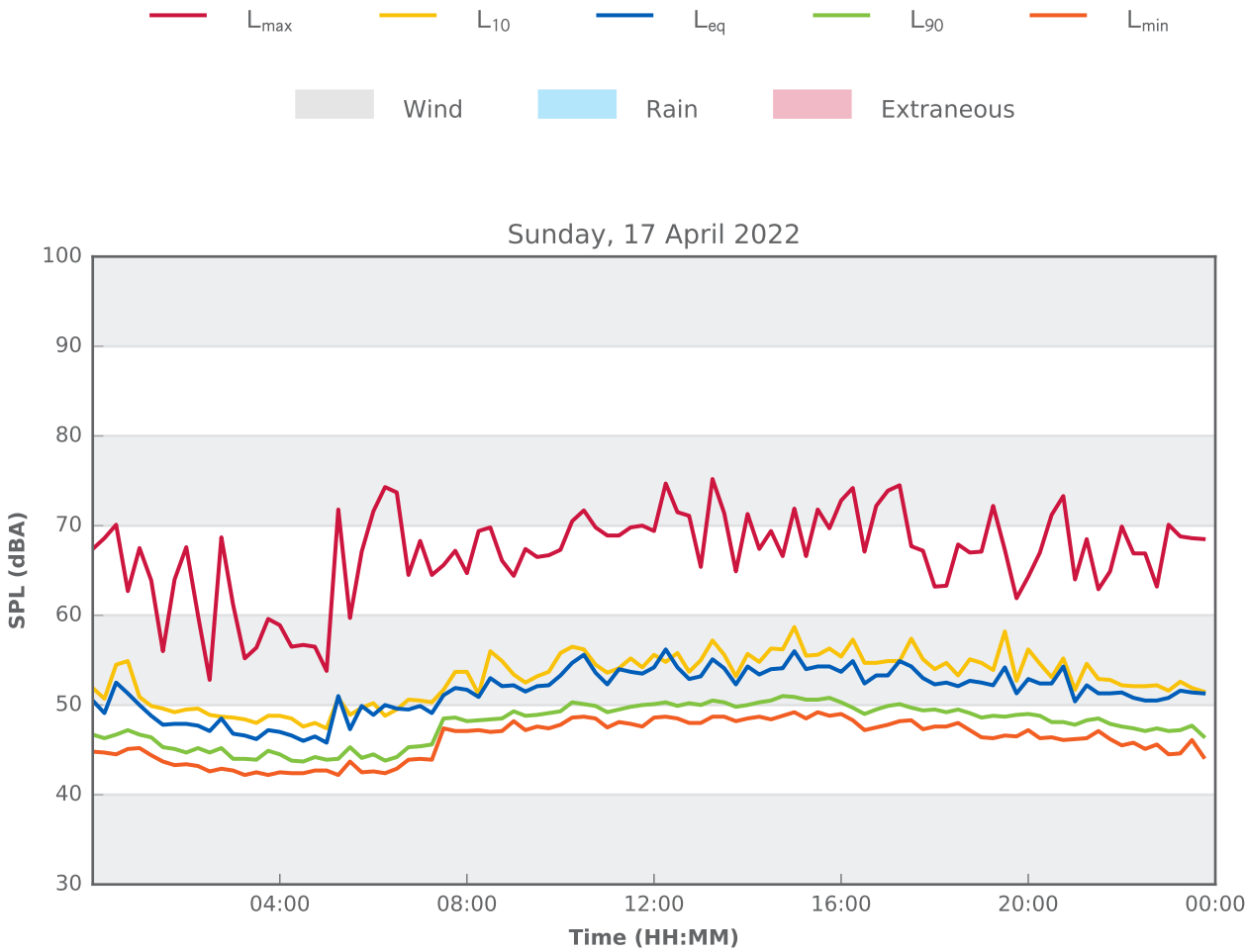
U2 - Cafe Rooftop



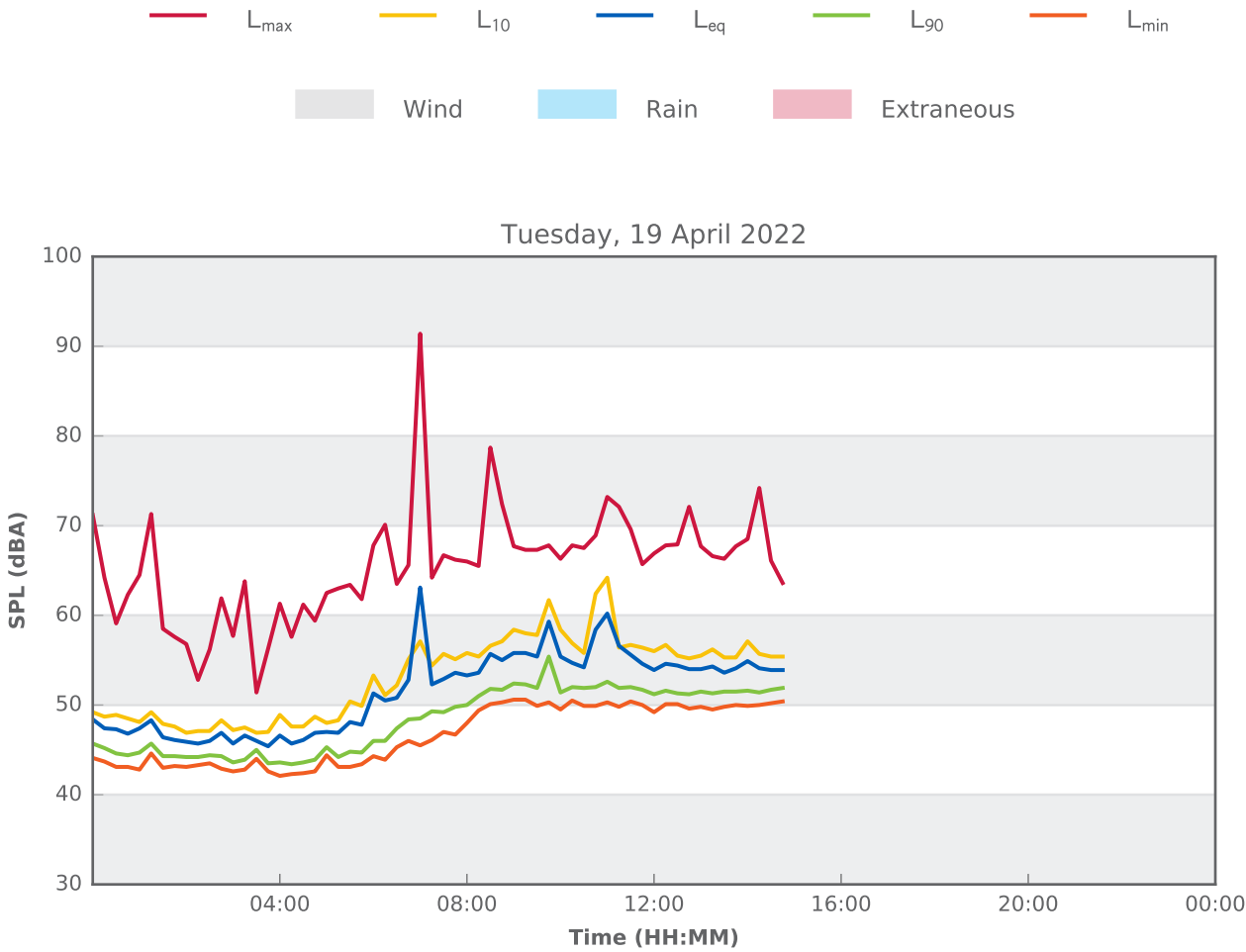
U2 - Cafe Rooftop



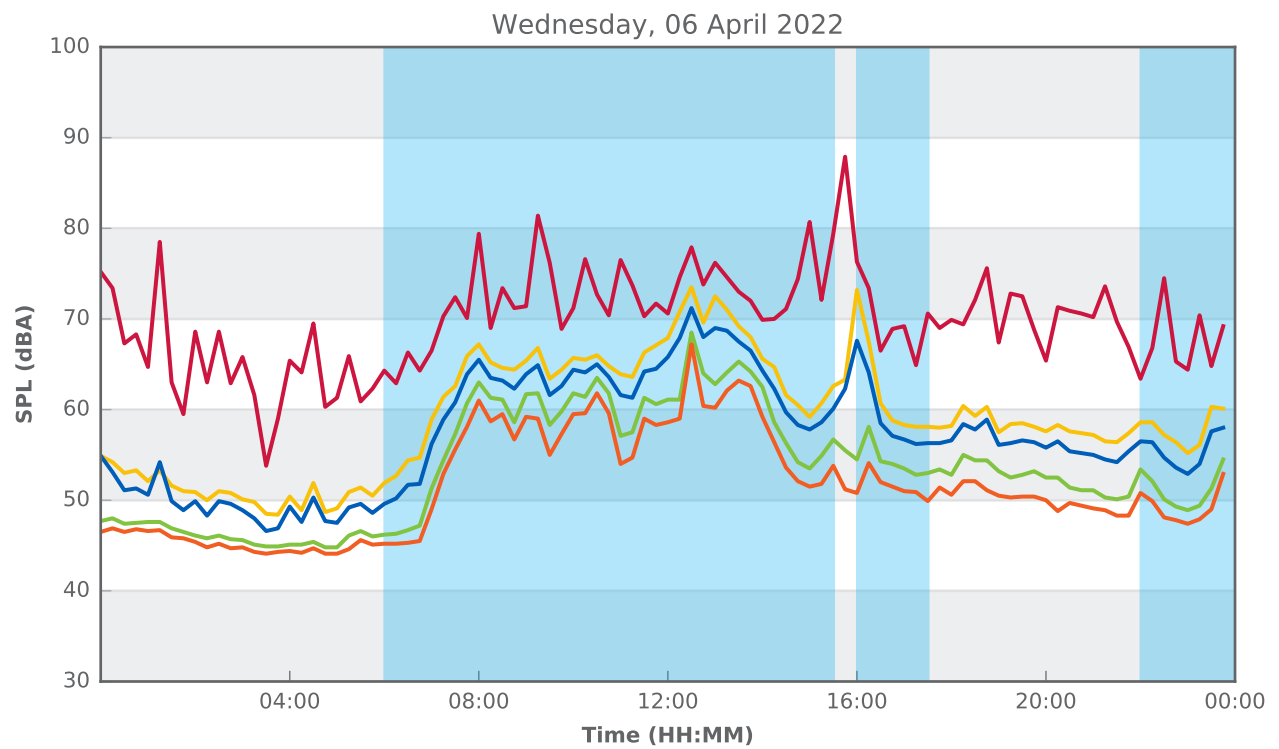
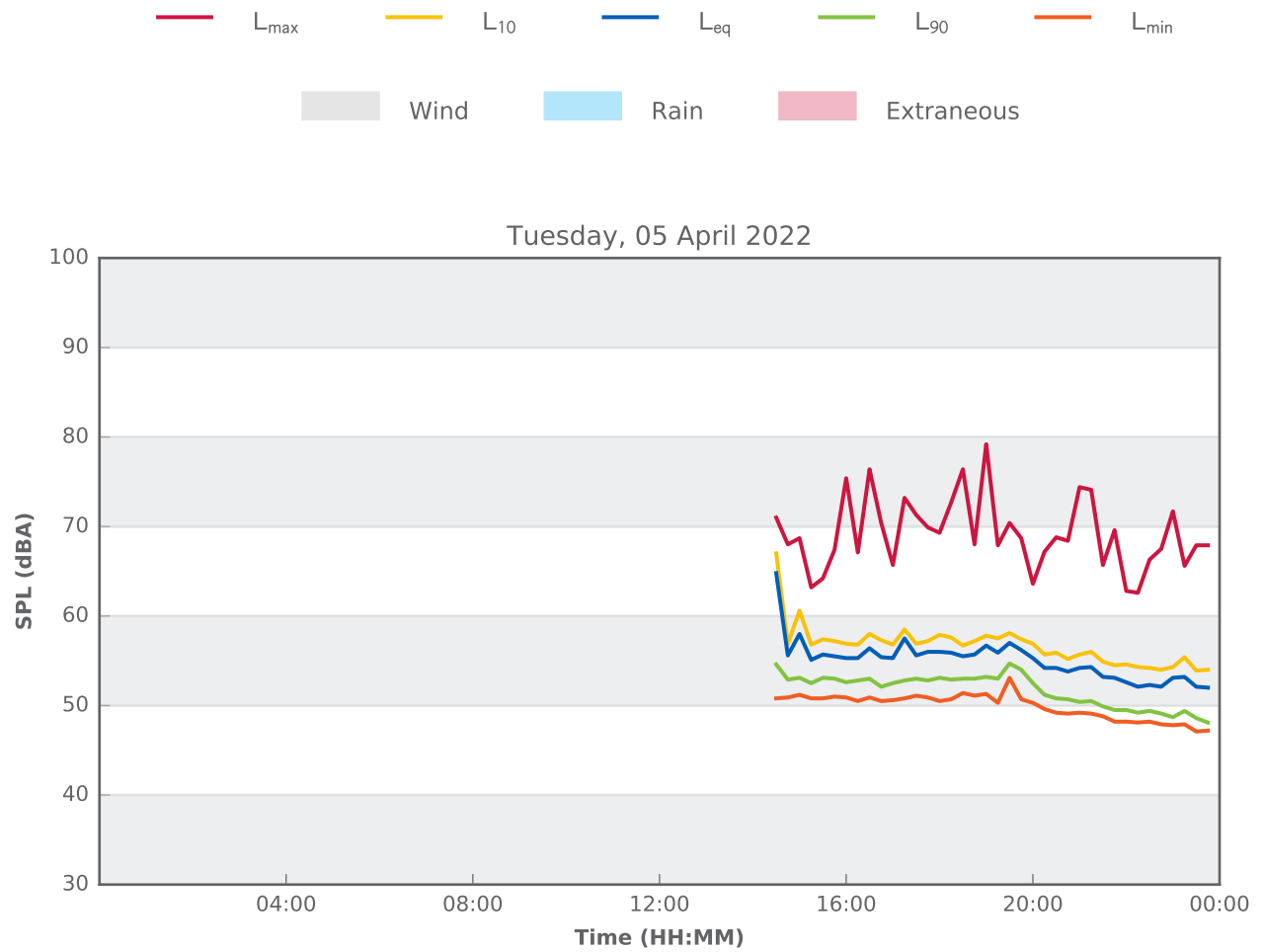
U2 - Cafe Rooftop



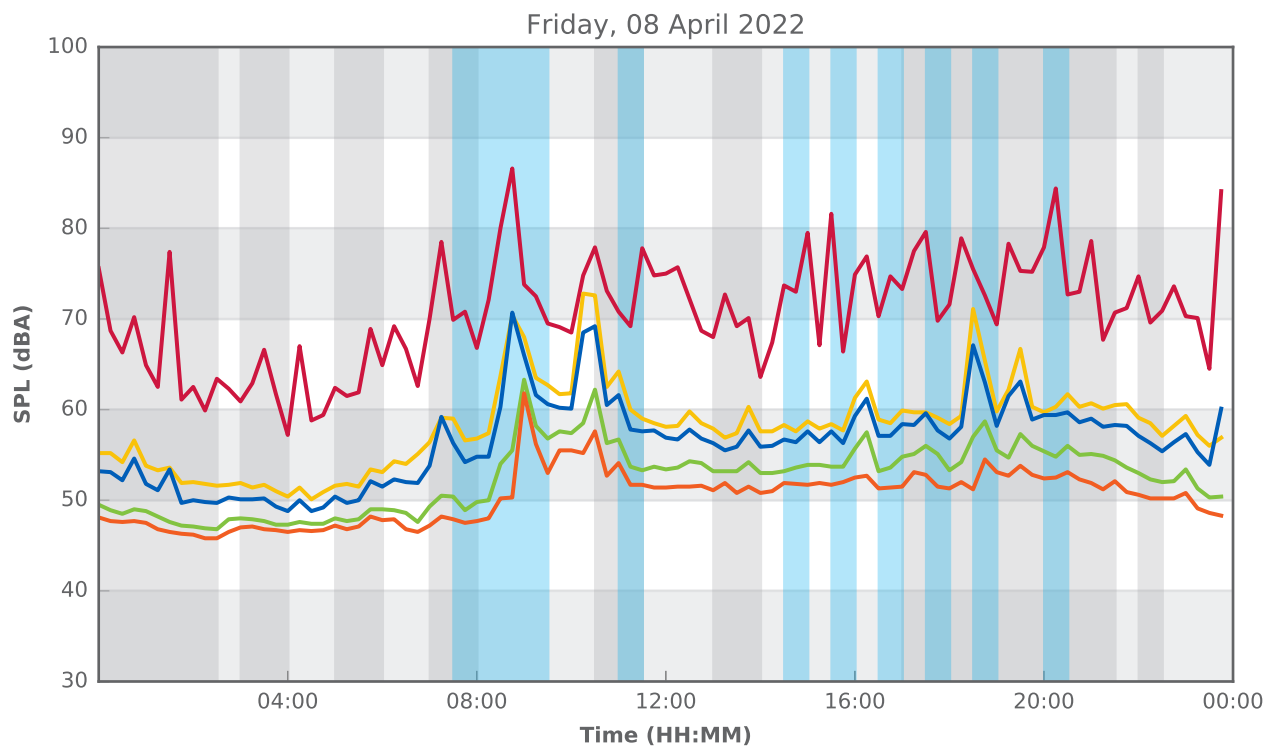
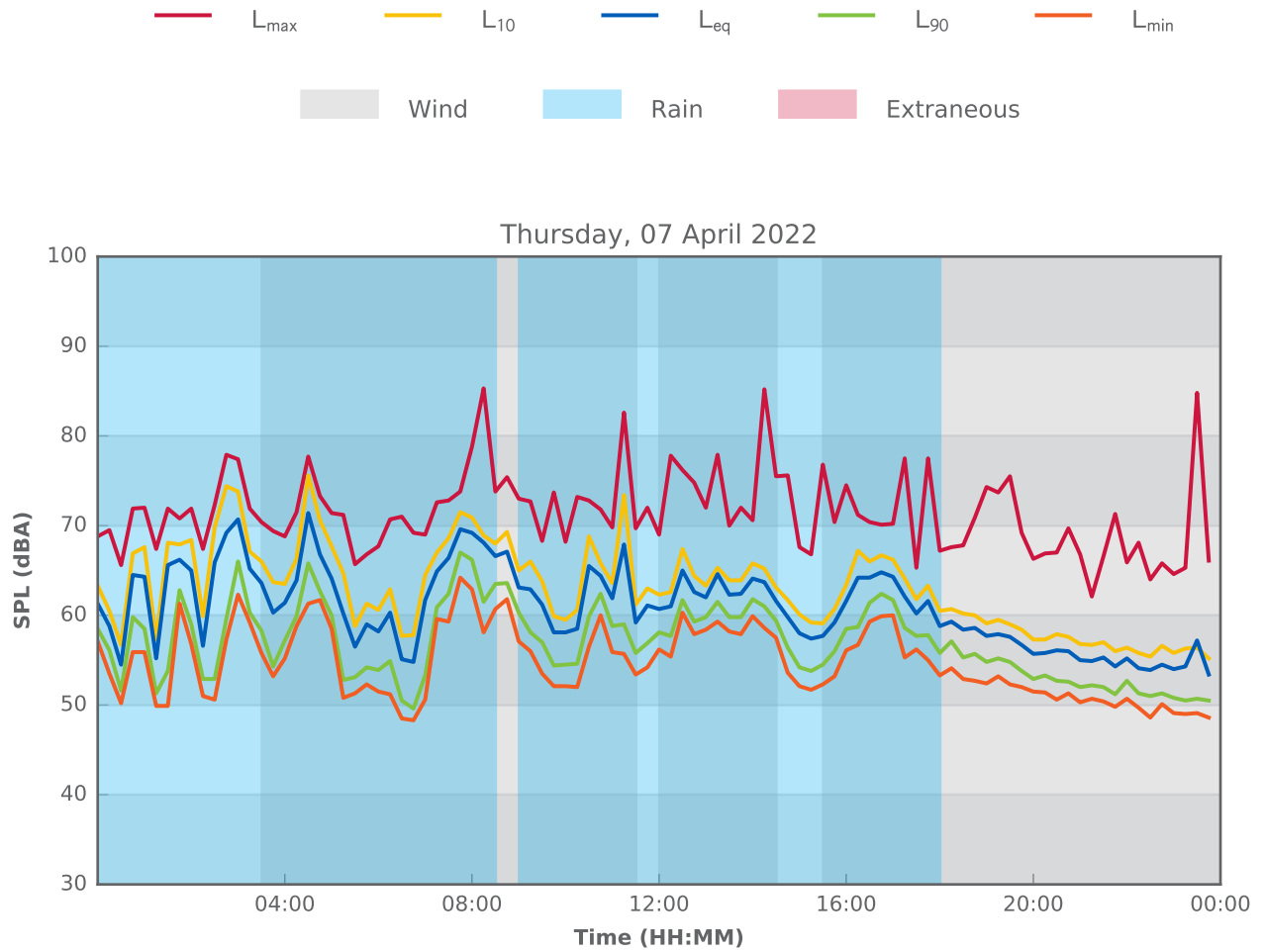
U2 - Cafe Rooftop



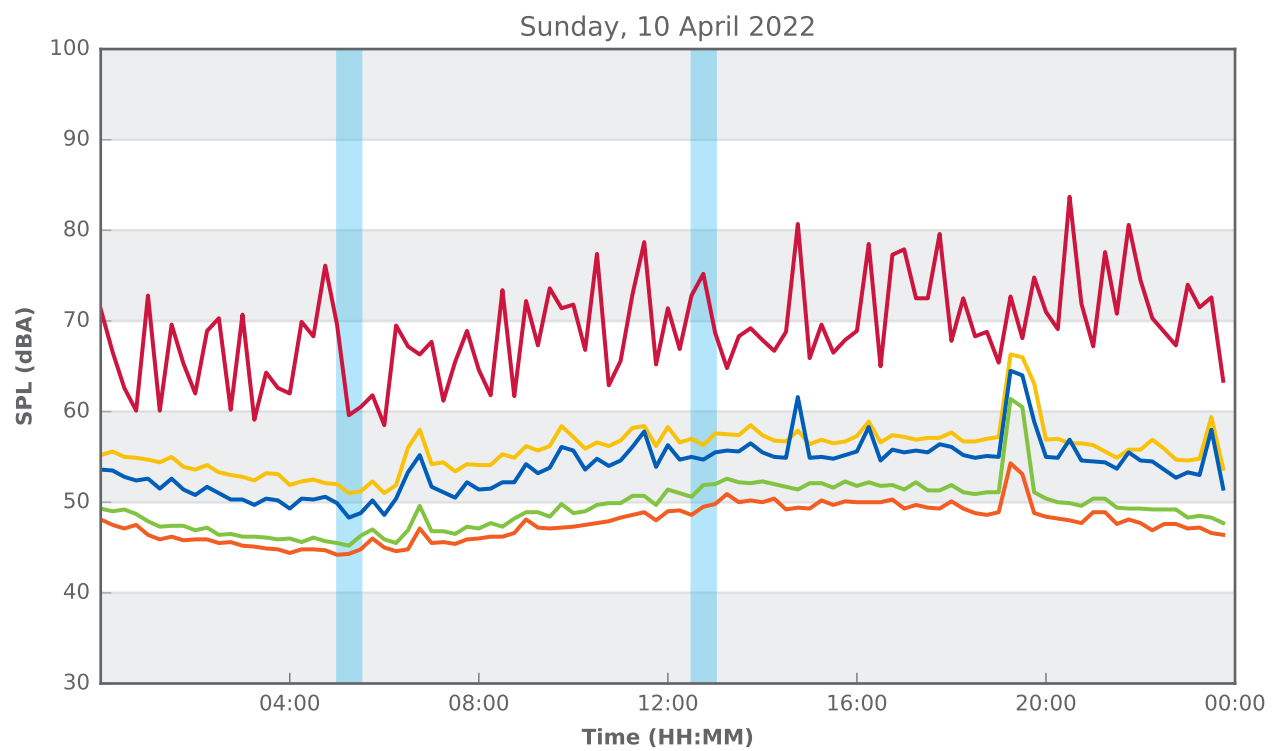
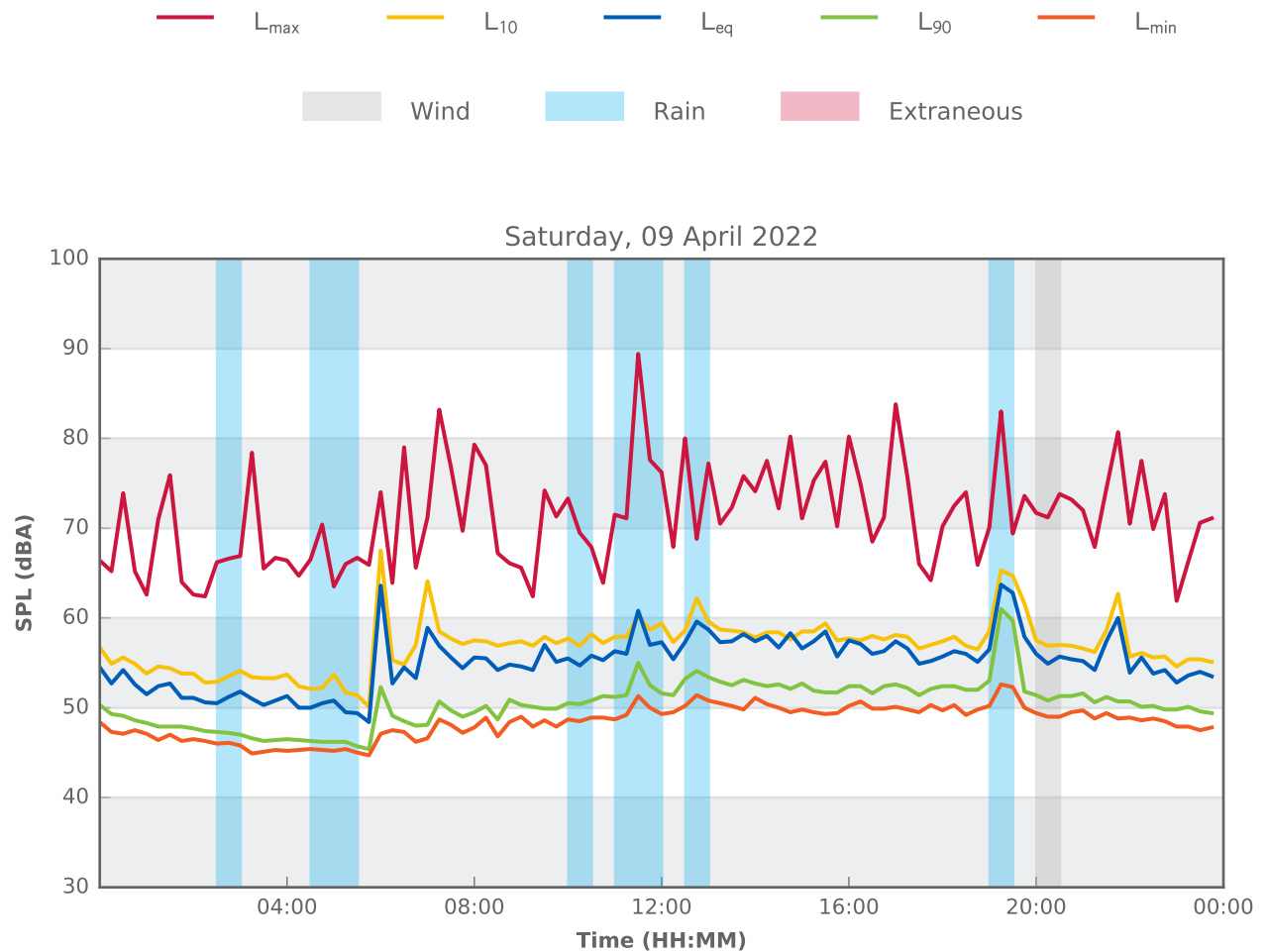
U3 - Omnibus Lane/Mary Ann Street



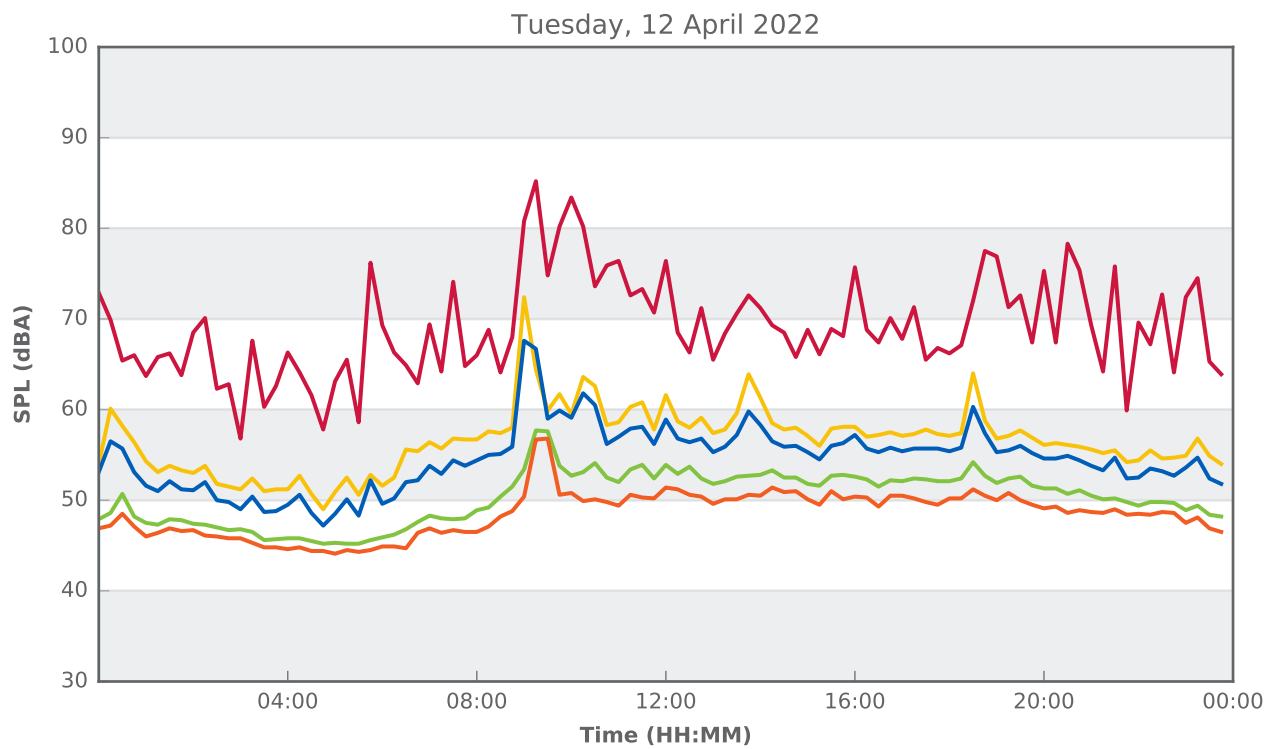
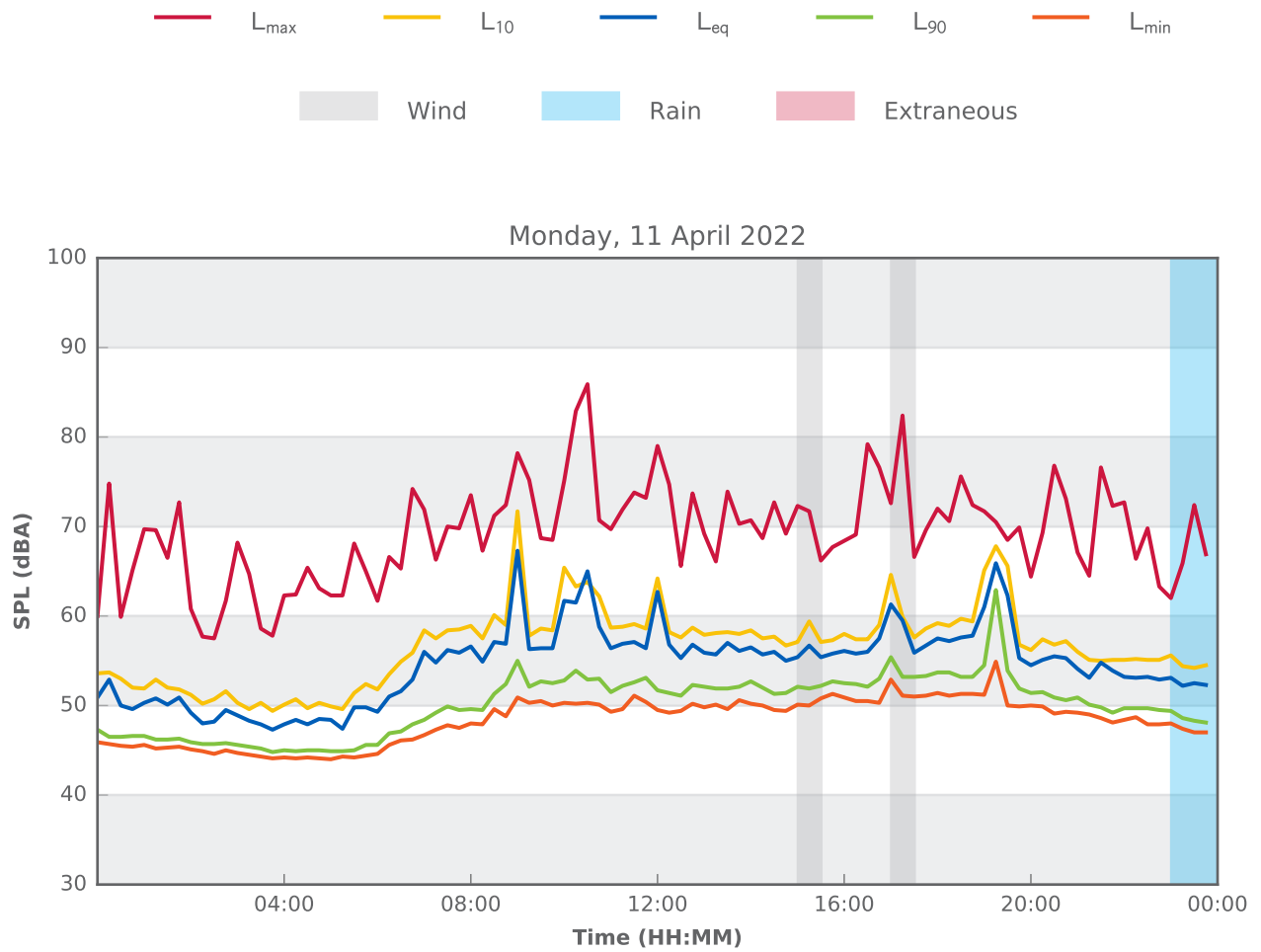
U3 - Omnibus Lane/Mary Ann Street



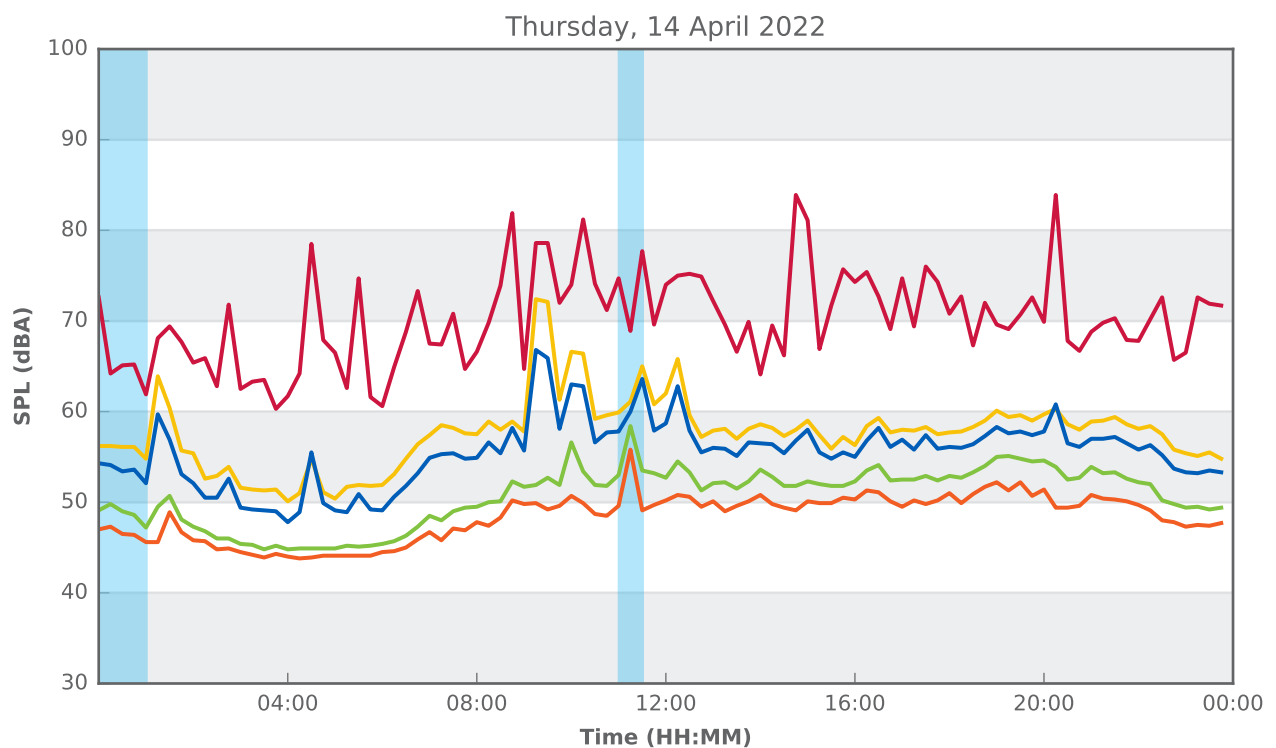
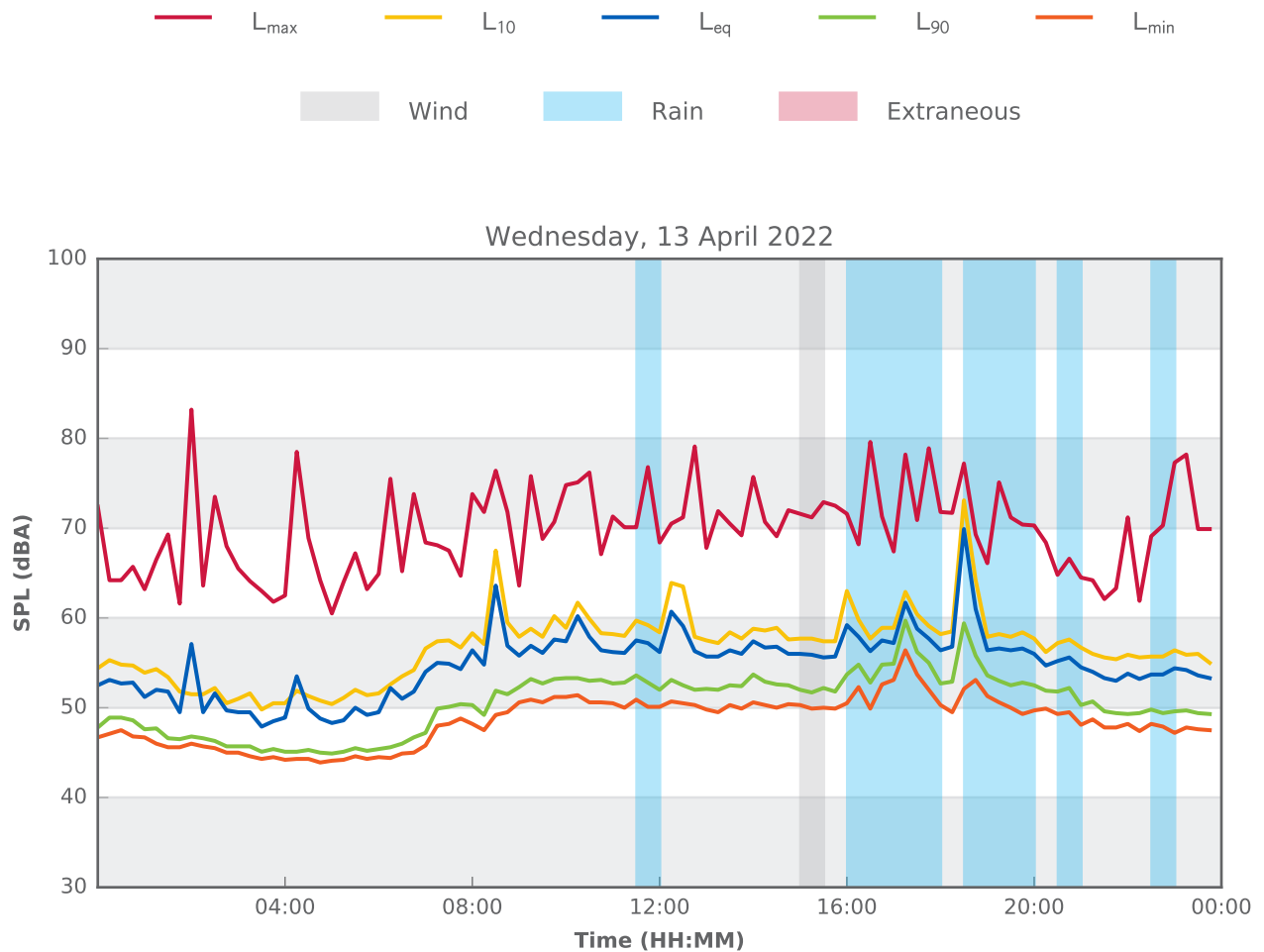
U3 - Omnibus Lane/Mary Ann Street



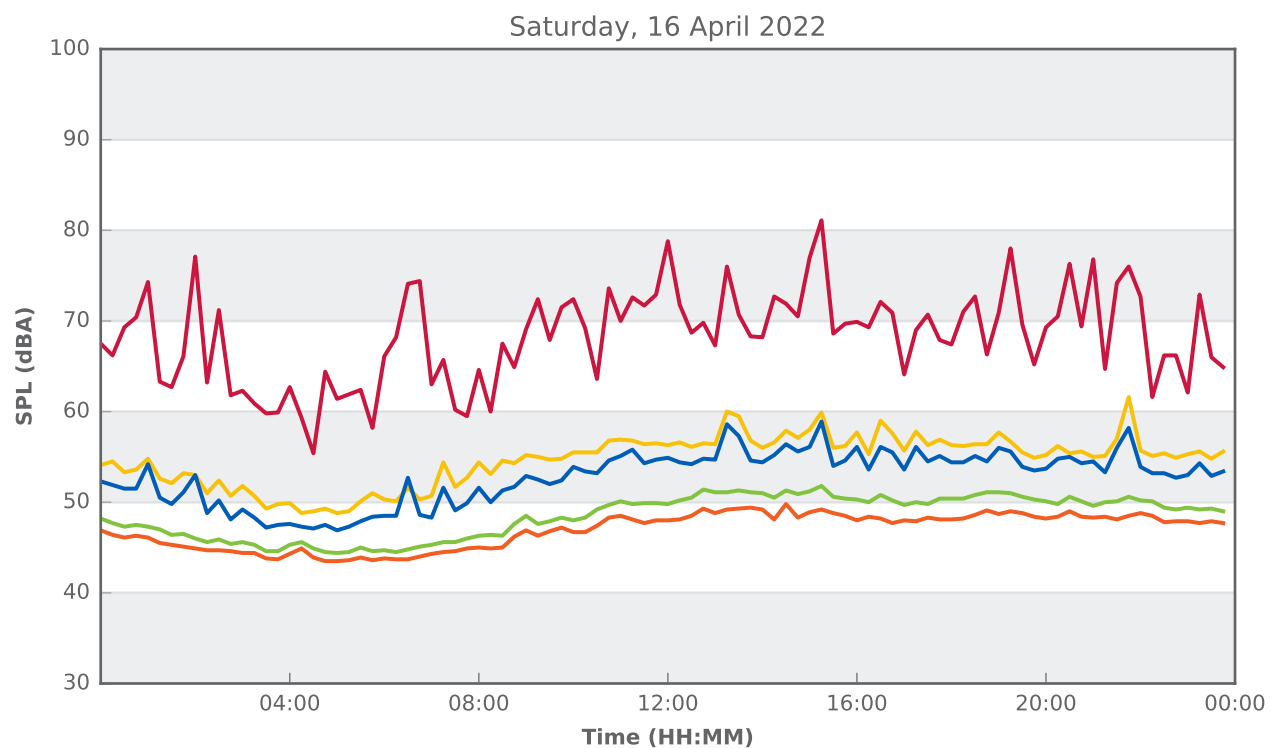
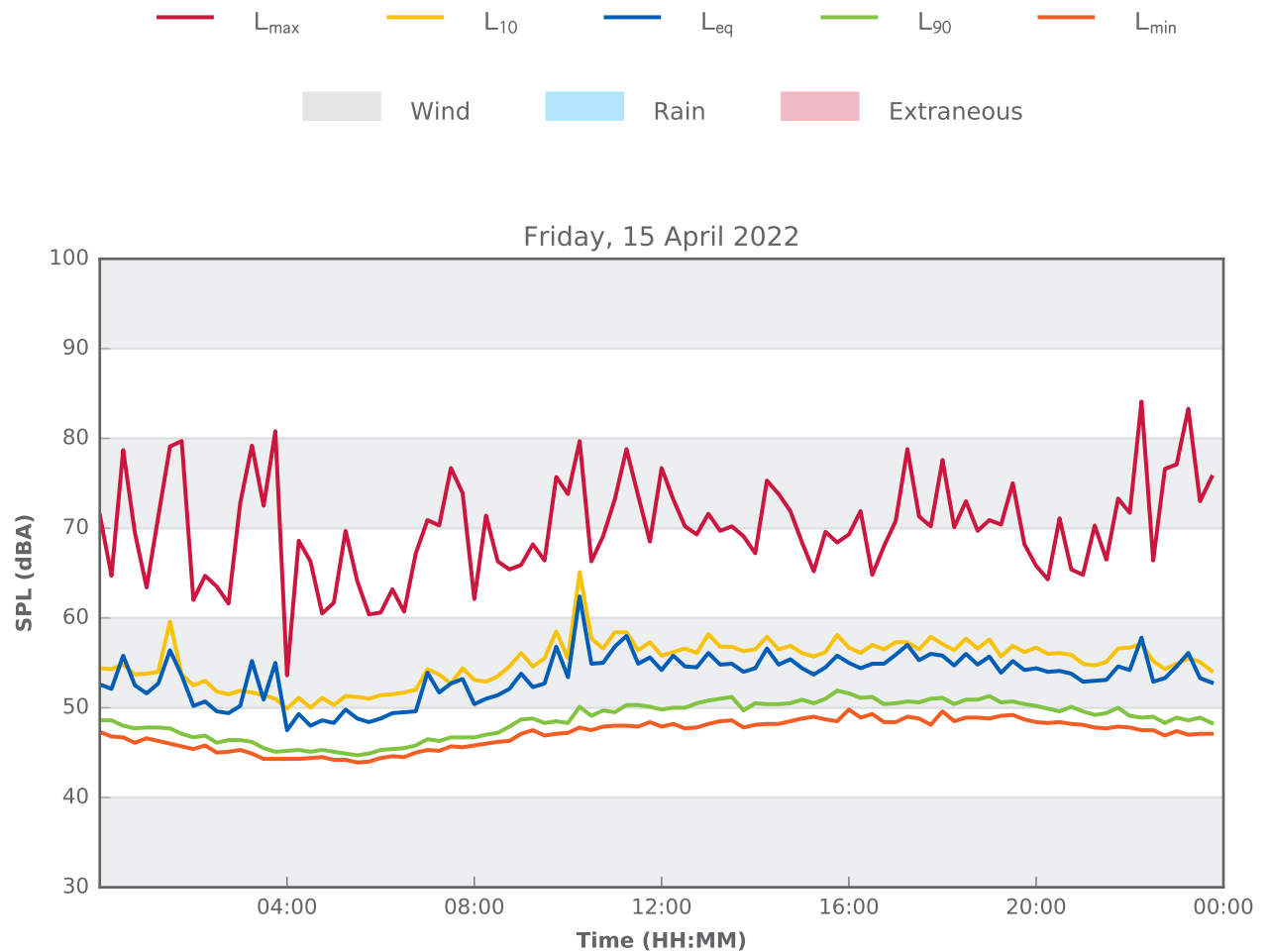
U3 - Omnibus Lane/Mary Ann Street



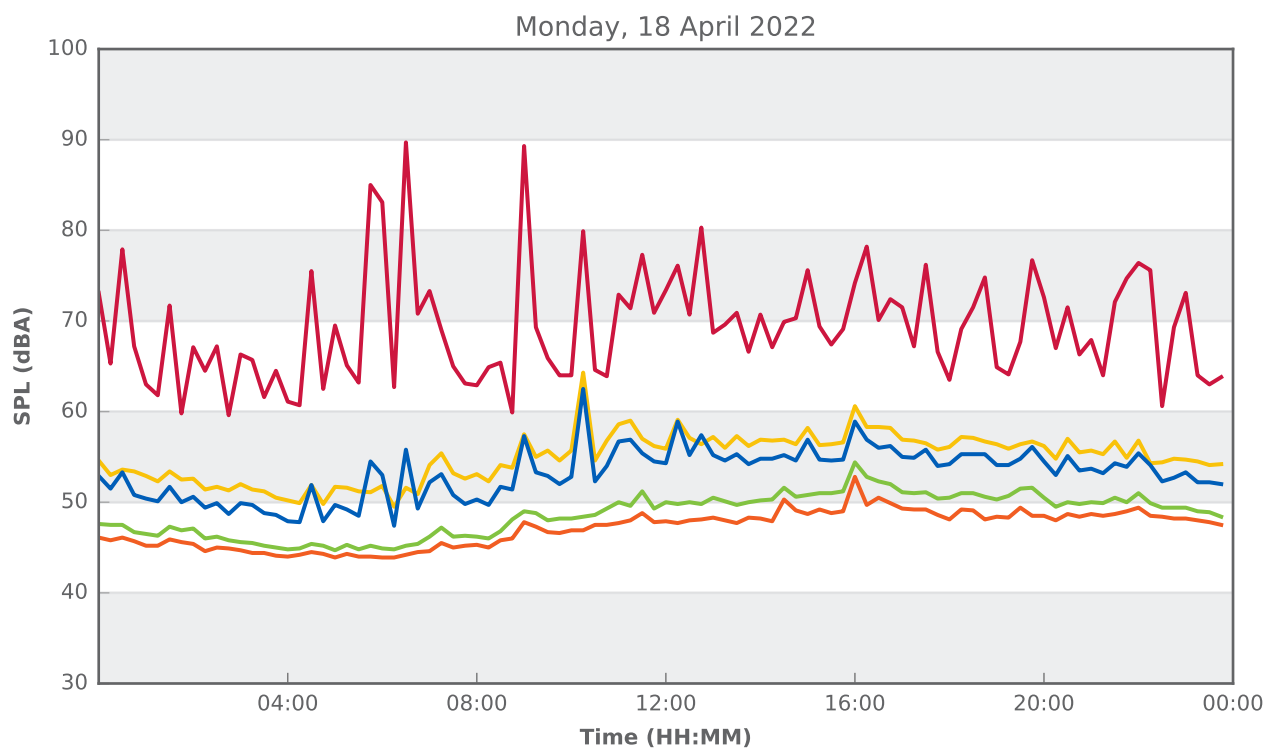
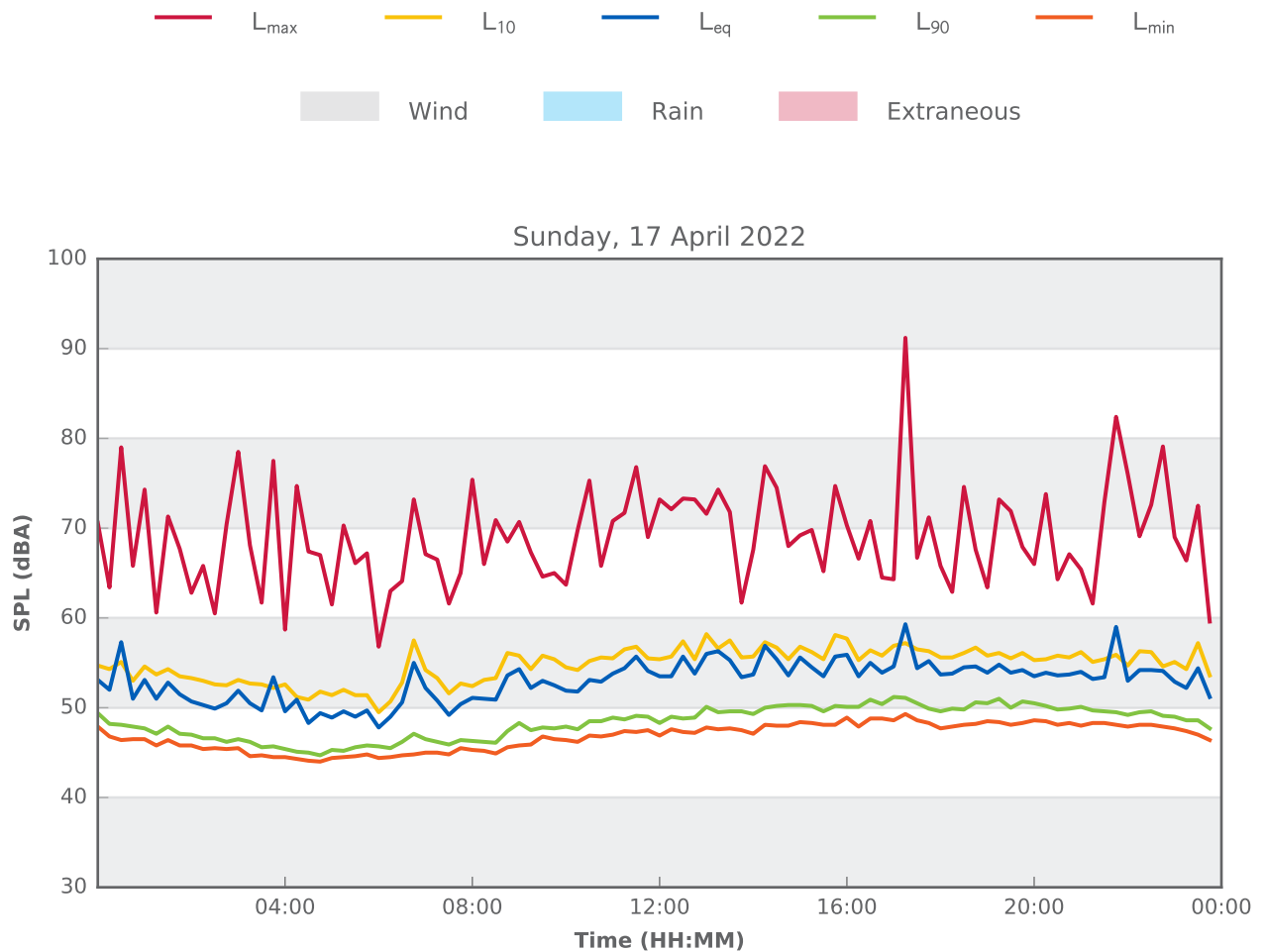
U3 - Omnibus Lane/Mary Ann Street



U3 - Omnibus Lane/Mary Ann Street



U3 - Omnibus Lane/Mary Ann Street



U3 - Omnibus Lane/Mary Ann Street

